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ON THE SIGNIFICANCE OF JAUNDICE IN TYPHOID FEVER, AND
ON THE HEPATIC COMPLICATIONS WITHOUT JAUNDICE.¹

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DURING the past winter there were in the wards at the Pennsylvania Hospital a number of cases of typhoid fever that presented the peculiar and rare symptom, jaundice. It is the object of this paper to analyze these cases and to inquire into the significance of jaundice when occurring in typhoid fever, at the same time that the hepatic complications in which jaundice does not generally happen will be passed in review.

CASE I.—A colored woman, aged eighteen years, was in the ward for a long time, extremely ill with typhoid fever. The course of the fever was marked by only moderate diarrhoea, but it was attended with very high temperature, the record showing temperatures of 105° and upward, and by nervous manifestations, especially delirium; the Widal reaction was decided. In this case of long-continued typhoid fever there appeared two striking symptoms: one was jaundice, the second was inflammation of the right parotid gland.

The jaundice appeared on the eleventh day of the disease, and though by the thirtieth it had greatly diminished, yellowness was still perceived in the conjunctivæ. The jaundice was not associated with any marked change in the size of the liver; if there were any, it was slightly increased, for the percussion dulness was distinctly to be detected below the margin of the ribs; the organ was painful to the touch when pressure was made over its free border, and there was general sensitiveness of the abdomen.

Subsequent to this state of things the right parotid gland gave evidence of inflammation, and became tumid and tender. The swelling at the angle of the jaw subsided without suppuration, under local

¹ Presented to the Association of American Physicians, May, 1898.

treatment with ice and applications of tincture of iodine, and by the thirtieth day of the disease there was very little to be felt of the parotid swelling, which at one time threatened to form an abscess. As further symptoms in the case may be noted nausea and vomiting, hebetude, and albuminous urine showing blood-cells and granular and hyaline casts, as well as pus casts and bile-stained epithelial cells. The urine was freely passed, forty-six ounces in twenty-four hours, and contained one-half gramme of albumin to the litre; it responded readily to the tests both for biliverdin and bilirubin. On several occasions chills occurred, but they were not severe; the blood was examined for malarial organisms, with negative results.

Jaundice persisted, though slight, for a few days more; the tenderness over the lower part of the liver disappeared; the bowels were constipated; the tongue was somewhat coated; the temperature was 99°. The urine, tested repeatedly when the jaundice was at its height, gave evidence of the presence of bile-pigment. The stools were never clay-colored; indeed, they were usually the ordinary stools of typhoid fever; sometimes they were noted as brown, sometimes as yellow, or greenish. No bile-pigment was detected in the urine on March 7th, the thirty-second day of the disease. The patient made a good, though slow, convalescence.

It is worthy of note that the jaundice was associated with parotid swelling, which I think more than a coincidence, as it has happened in other instances, as we shall further on see.

Let me now give the particulars of a case of jaundice in typhoid fever which came on very late in the disease, only three or four days before death, and grew in intensity to the fatal ending.

CASE II.—Sarah K. B., aged thirty years, white, was admitted February 18, 1898, with the statement that thirteen days previously she had been taken ill with anorexia, diarrhœa, vomiting, and epistaxis. She had not had a chill, headache, or cough. Upon admission her temperature was 104°, the pulse 120, the respirations were 40 to the minute. Her cheeks were flushed, the pupils were large, the sclera clear, the conjunctivæ of a good color. Sordes existed upon the teeth and lips. The tongue was dry, red at the tips and edges, with a brown streak in the centre. Her breath was fetid. The lungs were clear on percussion; there were no râles. At the apex of the heart was heard a blowing systolic murmur, not transmitted; at the base, too, was a soft, blowing systolic murmur, which was transmitted into the carotids; there was no venous hum. The heart's action was regular, but rapid. The pulse was small in volume, and dicrotic. The liver dulness began at the sixth rib, and extended to the costal margin; the border was not palpable. The spleen extended from the eighth rib in the mid-axillary line to the last rib; it was not palpable, and not tender upon percussion. The abdomen was tympanitic, and, upon pressure, pain and gurgling were elicited in the right iliac fossa. Characteristic rose-spots were found on the abdominal surface. There was pre-tibial œdema, and some pain upon pressure in the legs.

On the following day it was noted that hebetude was marked, the facial expression was dull, the temperature was 102° to 103°, the pulse

very weak, dicrotic, and compressible. The urine was straw-colored, with an abundant sediment. It was acid, of specific gravity 1030, and contained a trace of albumin, with abundant urates and granular and hyaline casts.

The treatment was beta-naphtol, three grains every third hour; whiskey, a half-ounce every second hour; strychnine sulphate, one-thirtieth of a grain every fourth hour, and a milk diet. The surface of the body was sponged with cold water every third hour, when the temperature was 103° or over.

During the next few days the bowel movements continued loose and frequent, from four to seven daily. The eruption became more profuse. The temperature was only kept down by systematic sponging. The splenic area of dulness became much increased, and some local tenderness developed. The tongue became dry, brown, and fissured. The Widal test of the blood yielded a positive reaction. The stimulant was increased to five drachms every two hours on the 21st, on account of the very dicrotic character of the pulse; but as this was better the next day, the whiskey was decreased to four drachms every two hours. The hebetude continued. There was epistaxis on the 23d. On the 24th the pulse was noted as stronger and more regular, though still rapid. A systolic murmur, looked upon as hæmic, persisted. There was marked throbbing of the carotids; the second cardiac sound was distinct. She was weak and exhausted, at times delirious, though the mind was mostly clear. On the 25th some yellowness of the conjunctivæ was observed, and the urine contained bile-pigment. On the 26th it was noted that the skin and conjunctivæ were markedly jaundiced. The pulse was feeble and compressible. The bowels were very loose, eight movements within the last twenty-four hours, notwithstanding the use of opium suppositories; the discharges were thin and yellow. Dilute nitromuriatic acid, fifteen minims, was given every four hours in place of the beta-naphtol, which had been discontinued. Oxygen inhalations were also employed, and she took strychnine.

On the 28th the records state that the delirium was deepening. She was intensely jaundiced all over her body. The eruption was still profuse. The liver was not enlarged or palpable; there was no pain or soreness over it. The pulse was very weak. Sordes were present on the teeth and tongue. The bowel movements were green and yellow, and still loose. In spite of a very free stimulation, the patient died of exhaustion during the evening. An autopsy was not obtained.

In the cases that have been detailed the jaundice occurred as a late symptom. Jaundice may be, however, an early symptom, and even show itself in advance of the fever, appearing as the result of an early infective process in the bile-ducts.

In a remarkable case which, so far as I know, is unique, the jaundice distinctly preceded the development of the typhoid fever, and occurred during the latter part of the period of incubation.

CASE III., a Danish weaver, was admitted into my ward at the hospital on January 7, 1884. He had been jaundiced for a few days without obvious cause. He complained of weakness and loss of appetite.

His temperature was 99.5°, the pulse 118. The next day the yellowness of the conjunctivæ and the skin was more marked, the tongue had a heavy yellow coat, the liver was observed to be somewhat enlarged, as was the spleen. The case was looked upon as one of catarrhal jaundice, and he was treated with phosphate of sodium and Rochelle salts, and placed on a restricted diet. The jaundice slowly improved and almost passed away, but the man did not get well, for, after the 19th he was noticed to be decidedly feverish, and on the 24th the morning temperature was 104°, and he was very weak; his face was flushed; diarrhoea set in. A note made at this time states that he had all the appearances of beginning typhoid fever. On the 27th there was no doubt of the correctness of this view. The tongue was coated, with red edges and tips. The abdomen was tympanitic, the movements from the bowels loose and of typhoid character. Rose-colored spots were found on the abdomen. He had repeated epistaxis.

He was treated with eight grains of quinine daily, with stimulus, with dilute muriatic acid, and, later, with turpentine. In the course of the case great restlessness, delirium, and subsultus tendinum were noted, followed by marked hebetude, increasing prostration, and frequent involuntary movements from the bowels. He died February 4th, from exhaustion.

At the autopsy the liver was found to weigh four pounds and eight ounces. The gall-bladder contained thin, pale-colored bile. There was no evidence of inflammation or ulceration of its mucous membrane, or of disease of the bile-ducts. The hepatic cells showed a cloudy swelling. The same condition was noticed in the epithelium of the kidneys, which were otherwise healthy. The spleen weighed twenty ounces, was highly congested, and its tissues soft. The posterior portions of the lungs were much congested. A number of infiltrated and ulcerated Peyer's patches were found in the lowest part of the ileum. There was also ulceration of many of the glands of the large intestine, and considerable swelling of the glands of the mesentery.

It is difficult in this case to state exactly when the typhoid fever began, but, counting from the appearance of the eruption, which we know to be between the seventh and ninth days, the fever probably started on the 18th or 19th of January, and thus about two weeks after the onset of the jaundice. This, therefore, would be strictly within the period of incubation, and it seems reasonable to suppose that the typhoid infection had lighted up a catarrhal process in the gall-bladder and bile-ducts which antedated the intestinal affection and disappeared in the course of the febrile malady. The alternative suggestion is coincidence, which seems very unlikely.

The case of jaundice in typhoid fever that I shall now describe was admitted into the Pennsylvania Hospital on January 31, 1898, the day on which I gave up the men's medical ward to my colleague, Dr. Arthur V. Meigs, who kindly permits me to give the details of the case as it developed under his observation.

CASE IV.—J. S., a waiter, aged twenty-six years, was admitted into the hospital with the distinct statement that he had never had

pneumonia, any affection of the liver, rheumatism, or typhoid fever. He had been ill for ten days previous to admission, and a week before his admission he was seized with a severe chill, followed by fever, sweats, and epigastric pains. From this time on, he had a number of chills, with severe abdominal pains, most acute over the region of the gall-bladder, accompanied by obstinate constipation and vomiting. When examined on admission his temperature was 102.2° , the pulse 88, the skin and conjunctivæ were decidedly jaundiced, the tongue was heavily coated, the abdomen rigid, not distended, but generally painful on percussion. There was no particular tenderness in the right iliac fossa. The greatest tenderness was over the region of the gall-bladder, and pressure there caused nausea. The liver was distinctly enlarged and palpable. A considerable amount of urine was drawn by catheter. The man lay in bed with his legs flexed and with all the appearances of a local peritonitis. Poultices were applied to the abdomen without material modification of the symptoms. On the evening of the first day the temperature attained to 104.4° . It declined to 98.6° the next morning, and then passed by evening to 103° . On the second day after admission it had fallen early in the morning to 99° . The patient was extremely restless, with clammy perspiration, the pulse was imperceptible, and he soon died.

His case suggested an inflammatory disease within the abdomen rather than typhoid fever, and the symptoms were such as might have been due to an appendicitis at the upper part of the appendix.

At the autopsy typical typhoid ulcers were found in the ileum and cæcum, the mesenteric glands were swollen, the spleen was large and friable; there was no peritonitis. The liver was considerably enlarged; its left lobe had a blunt edge. There was no abscess or gross lesion in the liver. The gall-bladder was distended with an unhealthy-looking bile; it contained no concretions; its coats were not altered; it had no adhesions. There was no swelling or sign of inflammation in the biliary ducts. The base of the right lung was congested.

It appeared at first from the symptoms that the case was one of cholecystitis; the nausea and vomiting, and especially the seat of pain, pointed to it. But the autopsy did not bear out this view, since no signs of inflammation of the gall-bladder were found. The distention of the viscus was the only thing to account for the pain; and the jaundice must, after all, have been the result of the blood alteration and the morbid condition of the liver structure. It is to be regretted that there are no microscopical or bacteriological examinations to record.

In the case we have just examined the jaundice was associated with the occurrence of chills; indeed these formed a prominent feature of the morbid manifestations. They were yet more so in the following case, though the lesion was, I believe, a different one. The man was shown at a clinic with great enlargement of the spleen in the course of typhoid fever, and the jaundice subsequently developed in the midst of very grave symptoms.

CASE V.—A Swedish sailor, aged twenty-three years, was admitted on December 6, 1897, with severe abdominal pain that was at first

over the whole upper part of the abdomen, but had localized itself in the left hypochondrium, extending almost to the crest of the ileum. The temperature was 99.6° . The bowels were moved two or three times daily; the discharges were not loose. The pulse was 120, weak and irregular; the tongue markedly coated and tremulous. The history obtained was that he had been an unusually healthy man who did not remember any illness except an attack of malaria some years ago. Eight weeks since, while at sea, he began to suffer with headache and weakness; subsequently was seized with fever; was delirious part of the time, and altogether decidedly ill for weeks on board ship. He was very weak when he left the ship, but after reaching land he began to improve until the last few days, when he had night-sweats, abdominal cramps, and felt himself very ill. The day of admission the temperature rose in the evening to 104.2° ; no rose-spots were found. The most marked feature of the case was the extent of the splenic dulness, which was 18 cm. in length from the sixth rib laterally, and passed fully two fingers'-breadth below the costal margin. The enlarged organ could be distinctly felt, and was very tender on pressure; indeed, the whole splenic region was tender to the touch, extremely so on percussion. Bulging was visible to the eye, and the line of dulness was influenced by inspiration and expiration. The heart's action was rapid, the second sound accentuated; there was no murmur; marked pulsation existed at the supra-clavicular notch.

He was looked upon as having typhoid fever with splenitis, and the question of abscess of the spleen was considered. There was some doubt whether we were dealing with the primary attack of the fever, prolonged by the condition of the spleen, or with a relapse; the former view was adopted. The patient was placed on dilute muriatic acid, twenty minims every fourth hour, on milk diet, and the ointment of iodide of mercury and lanolin, equal parts, with four grains of extract of belladonna was rubbed in over the spleen. The blood examined microscopically showed 4,500,000 red to 6000 white corpuscles. Widal's reaction was positive. The urine was acid, of specific gravity 1029, and contained neither sugar nor albumin, nor casts.

On December 9th, three days after admission, a crop of rose-spots was found on the abdomen. These disappeared by the 13th; his whole condition was steadily improving, and the temperature had become normal. A note on the 16th speaks of the large size of the spleen persisting, but of the tenderness having gone; of the absence of tympany, of tension of the abdomen, and of any signs of cardiac disease. On the 17th the temperature began to rise, and by the evening of the 18th it had attained to 105° ; the pulse was 148, and weak; the respirations were 40. There was slight return of the splenic tenderness, but nothing marked. The blood was examined for plasmodium; none was found. Dark days followed, with recurring severe chills and temperature of 106° , with a pulse weak and 156, with hurried, shallow breathing and congested lungs, but with the murmur remaining vesicular. The first sound of the heart was indistinct, the second clearer and well defined. In the blood, repeatedly examined, no plasmodium was detected; a repetition of Widal's test gave again the same positive result. Quinine in large doses produced no effect on the chills, and but little on the temperature. A cold bath reduced it to 95° , but he did not bear the bath well. The temperature rose again by the next day to 105.3° , and

two chills happened on that day. After the chills and the fever rises the patient did not sweat, but the skin was moist. A note of the 21st mentions yellowness of the skin and the conjunctivæ, and bile in a urine free from sugar, but slightly albuminous and containing hyaline and granular casts. There was no distention of the gall-bladder; the lower border of the liver could be felt, and was slightly tender; the organ extended just below the margin of the ribs. General abdominal pain existed at the upper part of the abdomen; the stools were not clay-colored.

During the time of the chills and fever, and at the height of the jaundice, the treatment consisted chiefly in sixteen grains of quinine daily, and in borate of sodium, ten grains every third hour, given for a time in place of the dilute muriatic acid, which, however, was afterward resumed; and, while the temperature was so high, three grains of phenacetin, with two of salol, were also administered with some apparent effect. For a time, too, the weakness of the circulation necessitated the free use of digitalis and of whiskey.

The temperature, by the 21st, became normal and remained so with occasional exacerbations during convalescence. There was, however, from January 2d to the 10th, a post-typhoid temperature reaching 102°, without return of the eruption. The splenic dulness gradually decreased, and by the 5th extended merely to the margin of the ribs; the jaundice had entirely disappeared by the 5th, even to urinary tests. The man left the hospital, well, on January 26th.

It is very difficult to explain this case. As regards the spleen, there was no doubt of its great enlargement and tenderness, more marked than I have ever seen in typhoid fever, and I looked throughout the case for an abscess. But no positive evidence of this was ever obtained, and if it happened, or a purulent infarction occurred—which, as Murchison noticed in two cases, softened—the purulent fluid was absorbed or encapsulated, and no rupture took place.

Regarding the spleen as the source of the grave symptoms, two views suggest themselves to account for the chills and the jaundice. One is that they were both pyæmic from the morbid process in the spleen, the jaundice being of blood origin, as it is in pyæmia. The second is that, considering the splenic vein as a main branch that goes to form the portal vein, infected thrombi produced a pylephlebitis, and that chills and jaundice, the latter certainly, resulted from the superinduced condition of the portal vein. The difficulty of adopting this view is the recovery. Still, we know that pylephlebitis may end in recovery. Frerichs tells us that this may happen when the pylephlebitis is not too extensive. In a recent operation for typhlitis Treves¹ actually saw the morbid lesions. The liver surface was dotted over with the innumerable yellow specks regarded as characteristic of the disease, and the patient's condition appeared hopeless, but she recovered. On the whole, I believe that the view of the patient whose case I have been describing having had pylephlebitis is the correct one.

¹ British Medical Journal, February, 1894

Jaundice is of very rare occurrence in typhoid fever. Sir William Jenner¹ states that he has never observed a case. Murchison² has met with it in but four instances, and had a fifth case communicated to him. My friend and late colleague at the Pennsylvania Hospital, James H. Hutchinson, reviewing his experience in typhoid fever in an excellent article,³ mentions that he had not seen this complication. Petrina,⁴ during the years 1875 to 1880, met with but one case in 194 deaths from typhoid fever. Griesinger is quoted by Liebermeister⁵ as having noted it ten times in 600 cases, and Liebermeister mentions that in the hospital at Basle it was observed twenty-six times in 1420 cases, or one in about fifty-five. These figures indicate higher proportions than jaundice is generally regarded as occurring in, except in hot climates. Jamieson⁶ states that in China it is generally, perhaps always, present to a greater or less extent in prolonged cases, and cites nine cases in which it was deep. But Sorel,⁷ in Algeria, observed only six cases in 871 of typhoid fever. In cold climates jaundice in typhoid fever must be very rare. Huss,⁸ in analyzing 2294 cases of typhus abdominalis—typhoid fever—in Stockholm, does not mention an instance. Yet Werner,⁹ in St. Petersburg, speaks of having observed ten cases in one outbreak of typhoid fever.

Prior to this winter I had met with but a solitary instance that I can recall, and it is remarkable that this paper, which contributes five to the scanty general number, should record four observed in the last few months, during which we have had a widespread epidemic of typhoid fever in Philadelphia. Where there is a complication of malaria, jaundice is not infrequent. Thus, in the report of so-called typho-malarial fever from the Seminary Hospital during the civil war,¹⁰ jaundice occurred in seven out of 64 cases, only one case of which was fatal.

As regards the time of the occurrence of the jaundice, it generally does not come on until the middle of or until late in the disease. In my own cases, omitting Case III., where it antedated the febrile malady, it began in one case (Case I.) on the eleventh day; in Case II., on the twenty-third day; in Case IV. it probably came on in the first week; in Case V., as convalescence seemed to have been reached. In most of the many instances on record that I have analyzed, it appeared in the second or third week of the disease. Still the jaundice may happen

¹ On Fevers and Diphtheria.

² Diseases of the Liver, 2d ed., 1877, p. 401.

³ System of Practical Medicine by American Authors, vol. i. p. 295.

⁴ Prag. med. Wochenschrift, 1881, No. 41-43.

⁵ Ziemssen's Cyclopædia of the Practice of Medicine, vol. i.

⁶ Imperial Maritime Customs, China Med. Reports, 1888-95, 37th Issue, pp. 63, 67.

⁷ Bull. et Mém. de la Société Méd. des Hôpitaux de Paris, 1889, tome vi. 3d series.

⁸ Statistics and Treatment of Typhus and Typhoid Fever, etc., 1855.

⁹ St. Petersburger med. Wochenschrift, 1892, p. 32.

¹⁰ Medical and Surgical History. Medical History, part iii. p. 805.

early, as it did in many of Jamieson's cases.¹ In one of Andral's fatal cases² it occurred on the third day; in a fatal case of Frerichs',³ on the fifth; in one of Murchison's⁴ that recovered, it appeared on the sixth day of a relapse; in one of Osler's⁵ cases, also ending in recovery, on the fourth day of a relapse; in one of Sorel's⁶ cases, not until convalescence; in McPhedran's case,⁷ just before convalescence. It may go on, and is apt to go on, gradually deepening until death, and may—though this is very exceptional—become dark and intense. In cases that recover the jaundice gradually disappears with the fever; yet it may persist into convalescence, as in Case I. of this paper, and even remain after the patient is able to be about.⁸

With reference to the symptoms that attend the jaundice, we do not find that they are constant; they are, as a rule, the symptoms of a severe case of typhoid fever with the usual amount of tympany and nervous disturbance. Delirium is apt to be present; yet I cannot say that it has seemed to me much aggravated by the hepatic condition, and there are intervals of clear mind even in the delirious patients, as happened in Case IV. and in Case V., in which questions are answered rationally. The temperatures are, as a rule, high, and, as the cases here presented prove, chills are not uncommon; nor are pulmonary congestions. Vomiting is a frequent but far from invariable symptom. The urine almost always contains bile, and, as in grave cases of typhoid fever, is apt to show some albumin and granular and hyaline casts. Examined by Murchison,⁹ in two cases, for leucin and tyrosin, these were not found. The character of the stools is of special interest; they are much like the ordinary typhoid stools, or darker and greenish; they are very rarely clay-colored. In four of the five cases here reported they were not. But in one of Murchison's¹⁰ cases in which jaundice happened during a relapse, the stools were noticed as clay-colored, and the same in Osler's¹¹ case in which jaundice appeared early in a relapse. There may be, as in one of Andral's¹² cases, marked constipation. Neither the temperature nor the pulse has appeared to me to be influenced by the occurrence of the jaundice; the temperature remains high, the pulse rapid. In some instances profuse sweats occur. The liver is generally somewhat sensitive to the touch, especially at its lower border. In the cases I have noted it was slightly enlarged or of normal size. But it has been observed to be much

¹ Loc. cit.

² Clinique Méd., 1834, vol. i.

³ Diseases of the Liver, 1858.

⁴ Diseases of the Liver, Case CXXXVII.

⁵ Case I., Transactions of the Association of American Physicians, vol. xii., 1897, p. 380.

⁶ Société Méd. des Hôpitaux, tome vi.

⁷ Canadian Practitioner, March, 1891.

⁸ Case XXXVIII. in Murchison, Treatise on the Diseases of the Liver.

⁹ Ibid., p. 420.

¹⁰ Diseases of the Liver, Case CXXXVII.

¹¹ Loc. cit., p. 380.

¹² Clinique Méd., 1834, vol. i. p. 11.

reduced, as in the case reported by Sabourin;¹ in the case mentioned by Frerichs, the hepatic dulness was almost absent.²

Complications attending the cases in which jaundice is met with are not unusual. Marked pulmonary engorgement existed in Cases IV. and V. detailed in this paper. In one of Andral's³ cases the patient died of left-sided pneumonia on the ninth day of the disease; both lungs were highly congested. In a case described by Louis⁴ in which jaundice and bilious vomiting occurred, there was a purulent swelling of the right parotid; abscesses were found in the liver. In the first case of my series there was also parotid swelling, but it did not suppurate. In Sander's⁵ case double parotitis followed; and the number of cases of combination of jaundice with parotitis in typhoid fever shows that it is more than coincidence. In one of Frerichs' cases,⁶ too, parotitis is mentioned, but it was associated with typhus rather than with typhoid, and, therefore, cannot be, strictly speaking, considered here. In another⁷ of his cases of jaundice in undoubted typhoid, profuse epistaxis preceded the jaundice, as it did in Case II. of my series. In Lannois' case⁸ the epistaxis was marked and repeated; the jaundice was very intense, black. Epistaxis, indeed, bears, I think, a distinct relation to the jaundice and its intensity. In one of Murchison's⁹ cases thrombosis of the femoral vein happened in a patient who had become jaundiced on the fourteenth day of enteric fever. In Freundlich's case¹⁰ thrombosis of the scrotal veins and gangrene of the left inguinal region coexisted. He had also double croupous pneumonia of the lower lobes. When jaundice is severe and occurs early, Jamieson¹¹ speaks of its usual association with hæmoglobinuria, intestinal hemorrhage, and hæmatemesis—indications of blood dissolution.

Having examined into the mode of appearance of the jaundice and the symptoms attending it, let us inquire into its origin. Is it a jaundice of obstruction to the flow of bile, such as we know catarrhal jaundice to be, or is it due to the blood condition and the changes in the parenchymatous structure of the liver? In the great majority of instances, most assuredly, I think, not to the former condition. It is usually a blood jaundice, with more or less disorganization of the red corpuscles and often associated with alteration in the liver cells. In favor of this view we have these facts: its occurrence, as a rule, as a late symptom and in grave cases; the character of the stools, which are

¹ *Revue de Médecine*, 1882, p. 600.

² *Observ. XVIII.*, Diseases of the Liver, vol. i., Sydenh. Soc. Trans., p. 215.

³ *Clinique Médicale*, 1834, tome i. p. 11.

⁴ *Fièvre Typhoïde*, vol. i., *Observ. XVII.*, p. 111.

⁵ *Deutsche Klinik*, 1861, p. 70.

⁶ *Diseases of the Liver*, p. 168.

⁷ *Ibid.*, *Observ. XVIII.*, p. 215.

⁸ *Revue de Méd.*, 1895, p. 911.

⁹ *Diseases of the Liver*, 2d ed., *Observ. CXXIX.*, p. 420.

¹⁰ *Deutsche Archiv. für klin. Med.*, Bd. xxxiii., 1883, p. 318.

¹¹ *Loc. cit.*, p. 63.

but little modified, and do not show any hinderance to the flow of bile; the general similarity to the jaundice noticed in other infective diseases and altered blood states, such as in pyæmia. The condition of the liver itself does not give us much information. Yet where the organ has been carefully examined it has been found to show degeneration, granular or fatty, of the hepatic cells, that has even been likened by Frerichs to the state found in acute atrophy. Then in some instances we have abscess, though not in many, for I shall presently show that in the majority of cases abscess of the liver attendant on typhoid fever is not accompanied by jaundice. Further, we may have a pyelephlebitis, with secondary changes in the hepatic tissue. However different, these causes may be all grouped together as non-obstructive jaundice—jaundice not from catarrhal obstruction of the bile-ducts. In a few instances this, however, does happen, and the records submitted in this paper prove that it is especially as a precursor to the active development of the enteric fever (as in Case III. of my own cases), or in the early stage of a relapse, that this kind of jaundice occurs.

Broadly speaking, then, the jaundice met with in enteric fever is due to the blood affection and the alterations produced by the toxins of the disease in the secreting cells of the liver, or to gross changes otherwise there induced, and only in exceptional instances to a catarrhal condition of the bile-ducts. Besides this, jaundice in typhoid fever occurs from inflammation of the gall-bladder and the morbid changes in the bile-ducts that may attend the cholecystitis. But this I only mention here to enumerate all the causes, as we shall presently examine this disease in detail.

It is apparent that jaundice in typhoid fever is not always associated with the same lesion, and that we can no more regard it as significant of any one hepatic disorder than we can jaundice met with in the varied diseases of the liver and bile passages, unconnected with typhoid fever. Further on, I shall endeavor to make clear in how far we can, with reasonable certainty, distinguish between the different causes of jaundice in typhoid fever; but for the present I again state that the most frequent cause is from the blood infection, and without gross organic lesion; though in a moderate proportion of cases this exists.

Taking this general view of the subject, let us inquire into the gravity of the symptom. It is, indeed, a grave symptom, as may be judged from this table, in which I have placed, together with my own cases, those in which there is sufficient detail to make them of any clinical value, and excluding the cases associated with perforation of the gall-bladder and other very marked gall-bladder lesions, which I shall speak of separately.

We have thus, in 52 cases, 33 deaths and 19 recoveries. Analyzing

further these cases, according to their probable cause, we find them thus grouped: 4 catarrhal; 3 pylephlebitis, of which in one (the case of McPhedran) there were also marked changes in the liver; 5 of cholecystitis, in 2 of which (the cases of Sander and of Griesinger) there was most probably, too, cholangitis; 6 cases of abscess of the liver; 5 of acute yellow atrophy or a state closely akin to it (2 of Frerichs, 2 of Murchison, and 1 of Sabourin), and 29 cases in which blood infection and more or less of a fine parenchymatous change in the liver existed; of these, 5 (Sorel's) are not fully enough reported to be at all certain as to the cause of the jaundice, and, for the sake of accuracy, cannot be counted, leaving 24 in which the condition just mentioned was either proved or may be with reasonable certainty assumed to have existed. It would be very desirable to separate those in which there is a mere blood infection, induced by the presence of the typhoid bacilli or their toxins in the blood, or the absorption of septic matter with or without infected thrombi, and leading to alterations in the blood-corpuscles, from those in which decided, though not gross, parenchymatous changes happen. But it is impossible to do so with any certainty. Moreover, there is no fixed line; changes in the liver texture are soon secondarily induced.

Looking at the results, according to the best-ascertained cause of the jaundice, we note in the four catarrhal cases three recoveries and one death, this being the catarrhal case of my series, which, however, died a considerable time after the disappearance of the jaundice. In the three cases of pylephlebitis we find one recovery and two deaths; in the five cases of cholecystitis with jaundice there were two recoveries and three deaths; in six cases of abscess of the liver, one recovery and five deaths; of the five cases of yellow atrophy all died.

The most common of the ordinary and lighter changes in the liver structure consists in a cloudy swelling, with granular degeneration in the hepatic cells. But Handford,¹ while mentioning that both parenchymatous and interstitial changes are frequently found, regards as the most constant and, perhaps, the most important of these, interstitial hepatitis. This may, as a sequence, lead to atrophic cirrhosis, as in a case reported by Bourdillon.² The little opaque areas of destroyed liver-cells, that were formerly described as lymphoid nodules, and are not uncommon, do not, so far as is known, give rise to any symptoms pointing to the necrotic change.

The question may arise whether the jaundice may not be due to some agent employed in the treatment. But it has been observed under the most diversified, including the cold bath, treatment.³ Werner,⁴ who

¹ Hepatitis in Enteric Fever. Trans. Path. Soc. London, 1889.

² La Semaine Médicale, September 30, 1891.

³ Goldammer mentions two such cases. Deutsch. Arch. f. k. Med., 1877, Bd. xx. p. 68.

⁴ St. Petersburger med. Wochenschrift, 1892, p. 32.

is an advocate of the use of chloroform in typhoid fever, states that he observed jaundice in four cases, very light in three, without swelling or tenderness of the liver, and stopped the remedy. But in six other cases treated with chloroform later, also in boys under fifteen years of age, notwithstanding the longer use of the remedy, jaundice did not occur.

Jaundice in typhoid fever happens most often at the *age* at which typhoid fever usually happens. But Petrina¹ reports a case in a woman aged fifty-six years; Burder,² one in a boy aged nine years. I do not know of a single instance in early childhood. As regards *sex*, many more cases have been met with in men than in women.

The main object of this paper is the consideration of the clinical significance of jaundice in typhoid fever, and this has now been done. But it would be incomplete without inquiring into the frequency with which jaundice is absent, though hepatic complications exist, and without a consideration of the character of these complications. Of the relative importance of these, we may get a fair idea by examining Hölscher's statistics in 2000 fatal cases of typhoid fever at the Pathological Institute of Munich.³ Among 227 involving the liver and gall-bladder, there were 203 of disease of the liver structure; 12 cases of abscess; 3 of acute yellow atrophy; 1 of amyloid degeneration of the liver; 5 of diphtheritic processes in the gall-bladder and suppuration, including one of perforation of the gall-bladder; 3 of oedema of the gall-bladder; while 22 in addition are classed simply as icterus, without being linked to any organic disease.

The ordinary parenchymatous alterations that are presumably represented by the 203 in the numbers just quoted, are not to be recognized during life, and force themselves on our attention only in the few instances in which they are attended with jaundice; the very great majority of the changes in the liver structure in typhoid fever give rise, indeed, to no symptoms. Leaving for separate consideration diseases of the gall-bladder, *abscess* of the liver is the affection which most often manifests itself. Yet it cannot be said that abscess of the liver in typhoid is often met with. Hölscher's statistics have just been quoted. Romberg mentions 677 cases with 88 deaths, among which there was but one liver abscess; it was associated with suppurative pyelophlebitis. Schultz⁴ analyzed 3686 cases with 362 deaths, without a single instance of hepatic abscess.

As regards abscess of the liver, I have collected twenty-two cases in which the association with typhoid fever seemed beyond doubt, and

¹ Prager med. Wochenschrift, 1881, Nos. 41 and 43.

² Lancet, October 17, 1874, p. 552.

³ Münchener med. Wochenschrift, January, 1891, Nos. 3 and 4.

⁴ Observations made at the Hamburg Hospital, quoted by Romberg, loc. cit.

which admit of more or less complete clinical analysis. Others that have been reported I have rejected as very uncertain, as the combination with typhoid fever is not proved. Bouillaud's case, mentioned by Andral,¹ which has been questioned, I have included. Of the 22 cases, 7 only had jaundice; in 3 it is specifically mentioned as not present, and in 12 it is not mentioned at all, making 15 cases out of 22 in which jaundice may be fairly presumed to have been absent. Thus jaundice is not a symptom to be depended on in the diagnosis of abscess of the liver in typhoid fever. More important are chills, violent, prolonged, and repeated, as in Barth's² case, and generally preceding the jaundice, should this happen, as in Romberg's case; great variations in temperature, as in Case I. of Petrina; profuse sweating and sensitiveness in the region of the liver. The liver may or may not be swollen; in Goltdammer's case it was swollen. In Gerhard's case³ the right hypochondrium was prominent, and tender on pressure, and fluctuation was detected over the right lobe of the liver. As further symptoms pointing to abscess of the liver, should there be any hepatic manifestations, are abscesses in other parts of the body, as in the parotid (Louis's case); in the perichondrium of the larynx (Chvostek's case); over the mastoid region (Sidlo's case). At times hepatic symptoms are wholly wanting, and the abscess is only found at the autopsy.

All the symptoms mentioned may also happen in pylephlebitis, except the rarest, fluctuation; especially the repeated chills, the pain and tenderness in the hepatic region, the high irregular temperature; and I know no way of distinguishing pylephlebitis from abscess, with which, indeed, it is generally classed, unless by the progress of the case, in which enlargement of the subcutaneous abdominal veins and collections of fluid in the peritoneum may be observed in addition. But the latter signs occur to a decided extent only where there is also marked thrombosis in the portal veins or its main branches, as in a case of Lannois,⁴ and there is apt to be painful enlargement of the spleen as well as of the liver. I think jaundice, most probably pyæmic and from infected thrombi, is apt to happen among the symptoms of pylephlebitis with greater frequency than in abscess of the liver not associated with this, and to become deeper; but it is far from invariable. It was absent in the case of Asch and of Bernhard,⁵ an instance of pylephlebitis from suppurating glands in the mesentery, and where there was a purulent thrombosis of the mesenteric veins and the venæ portæ were full of pus.

¹ *Clinique Méd.*, 3d edition, 1834, vol. i. p. 616.

² *Bull. de la Soc. Anat.*, 1853, p. 80.

³ *Medical News*, July 24, 1886.

⁴ *Revue de Médecine*, 1895, p. 913.

⁵ *Berlin. klin. Wochenschrift*, 1882, xiv. p. 772, and *Jahrb. für Kinderheilkunde*, N. F., 1886, Bd. xxv.

TABLE OF FIFTY-TWO CASES OF JAUNDICE OBSERVED IN TYPHOID FEVER, WITH RESULTS.

No.	Author.	Reference.	No of cases.	Probable cause of jaundice.	Marked associate symptoms.	Result.	Post-mortem appearances.	Remarks.
1	Andral	Clinique Médicale, 1834, vol. i. pp. 10, 616.	2	Blood infection	In the first case pneumonia of left lung; heavy congestion of both lungs. In the second case jaundice very marked.	Died.	In both cases lesions of typhoid fever; condition of liver not stated in first case. In second nothing abnormal was seen in liver and biliary passages.	
2	Louis	Fievre Typhoide, 1841, vol. i. obs. xvii. p. 118, and obs. xxvi. p. 369.	2	Blood infection and liver abscess in first case; blood infection in second case.	In the first case suppurating parotid gland; pain in the sides and in epigastrium; bilious vomiting; marked delirium. In the second case jaundice on the twenty-fifth day of the disease, preceded by erysipelas of leg.	Died.	Typhoid fever lesions in intestines; enlarged mesenteric glands; an abscess near the free border of the liver; six smaller masses (metastatic abscesses?) in the small and middle lobes; bile passages healthy. In second case many typhoid fever ulcers; softened mesenteric glands; healthy liver and biliary ducts; distended gall-bladder.	
3	Frerichs	Diseases of the Liver, obs. xlii., 1858, obs. xviii.	2	Blood infection and parenchymatous change in liver (like acute yellow atrophy).	Great tenderness in region of liver, and afterward of entire abdomen; thin greenish stools; bilious vomiting; chill, dyspnoea. In the second case chill; thin, pale stools; violent epistaxis; tremor; dyspnoea; diminution of hepatic dulness.	Died.	Typhoid ulcers in ileum; debris of disintegrated cells, oil globules in the portions of softened liver; liver yielded lucid and tyrosin abundantly; gall-bladder not affected. In the second case liver shrivelled; disintegration of hepatic cells, some filled with fat; mucous membrane of gall-bladder not affected; small quantities of whitish fluid in gall-bladder. Biliary ducts were found to be dilated, and a large number of stones were in the gall-bladder.	
4	Sander	Deutsch. Klin., 1861, p. 70.	1	Cholecystitis and probably cholangitis.	Jaundice appeared at end of second week; became very marked; vomiting; grayish stools; severe pain like bilious colic; tenderness in hepatic region and enlargement of liver; after five or six days gradual disappearance of the jaundice.	Died.		After having entered on convalescence, the patient died in the eighth week subsequent to double parotitis.
5	Chvostek	Med. Chirurg. Rundschau, June, 1864, p. 188.	1	Blood infection; liver abscess.	Laryngeal perichondritis; deep jaundice; abscess of lung; pneumothorax	Died.	Two large abscesses in liver, evidently pyemic and secondary; also abscess in left lung.	

6	Burder	Laurel, Oct. 17, 1874.	1	Blood infect'n; liver abscess.	Icterus on sixth day of fever in a boy nine years of age; greatly increased after a chill on the eighth day; liver dulness normal; diarrhoea.	Died.	The liver was a mass of small abscesses; superficial ulceration of Peyer's patches.	Had the bath treatment; death on seventeenth day of the disease.
7	Heitler	Wien, med. Presse, 1875, No. 3.	1	Blood infect'n; parenchymatous change in liver.	Date of beginning of fever uncertain; jaundice probably about third week, preceding diarrhoea; stools bilious, albuminous, also blood and tube-casts in it; normal liver percussion; increasing jaundice; delirium; coma.	Died.	Ulcers in ileum; lungs congested; liver rather large, flabby, soft; brown bile in gall-bladder; spleen enlarged to four times its normal size.	
8	Sidlo	Der Militär Arzt., Wien, 1875, No. 23, p. 20.	1	Abscess of liver.	Pain in the hepatic region on thirty-second day of typhoid fever; on thirty-fifth day jaundice; swelling of liver; abscesses over right mastoid, in right temple, and in right axilla; tumor there gradually shrank; great emaciation; gradual diminution of liver dulness and of jaundice.	Recov.	.....	Abscess of liver discharged through bowel, pus and blood passing by the bowel on eighty-fourth day, after severe abdominal pain; complete recovery by one hundred and twentieth day.
9	Griesinger	Infectionskrankheiten; detailed also by Hagenmüller, Thèses de Paris, 1876, No. 269.	1	Cholecystitis with probable cholangitis.	Woman, aged twenty, in sixth week of typhoid fever, peritonitis, icterus, chills; painful tumor to right of umbilicus; swelling of liver; great prostration; convalescence. In eighth week return of tumor, with chills, icterus, vomiting; got better; subsequently two more relapses; the symptoms disappearing under treatment with large doses of opium. Final recovery in fifth month.	Recov.	.....	The patient had previously had jaundice several times, especially at her periods. The case is remarkable for its length, the recurrence of the symptoms, and the final recovery.
10	Laveran	Case communicated to Hagenmüller and published by him, Thèses de Paris, 1876, No. 269.	1	Cholecystitis.	Repeated bilious vomiting, severe pain in right hypochondrium, which is painful; icterus slight; fever reaching 40.6° C.; considerable prostration; no tumor mentioned.	Recov.	.....	Symptoms came on in sixth week, early in convalescence.
11	Goldammer	Deutsch. Arch. f. k. Med., 1877, vol. xx. p. 68.	2	First case most likely from blood infection and parenchymatous change. Second, catarrhal; but not fully enough reported to be certain.	Tenderness and swelling in hepatic region in one case of severe typhoid fever; no details given of second case except that the jaundice was of short duration and occurred in convalescence.	Recov.	.....	Very meagre details given. In both cases the bath treatment had been employed.

No.	Author.	Reference.	No. of cases.	Probable cause of jaundice.	Marked associate symptoms.	Result.	Post-mortem appearances.	Remarks.
12	Murchison	Diseases of the Liver, 2d ed., 1877. Cases CXXXVII, CXXXIX. Two mentioned (p. 401) without being described. One case (under Rostan's care) communicated (CXXXVIII.).	5	One catarrhal (CXXXVII.); one blood infection (CXXXIX.); in the other two blood infection & pareuchymatous changes; in the communicated case this also most likely cause.	In first case clay-colored stools; no hepatic tenderness; constipation; jaundice occurred in a relapse; case recovered. In Case CXXXIX, jaundice appeared on fourteenth day associated with albuminuria, subsequent thrombosis, jaundice passed away; death from gradual exhaustion. In two cases no particulars. In communicated case jaundice persisted during convalescence.	3 died. 2 recover	In two cases liver found to be small, and its secreting cells loaded with oil.	
13	Petrina	Prag. med. Wochens., 1881, Nos. 41-43.	4	Case I. Blood infection, pyelitis with thrombi, milium abscesses in liver.	Severe typhoid case; jaundice appeared thirteenth or fourteenth day of disease, not preceded by chill, and gradually increased, becoming very deep; fever high (highest 40.6° C.), with marked morning remissions and evening exacerbations; profuse sweating; moderate meteorism; liver enlarged and sensitive, left lobe especially; stools yellowish-brown or brown; profuse diarrhoea toward end; bile-pigment but no albumin or sugar in urine.	3 died. 1 recover	Fresh and old cicatrizing lesions in Peyer's patches; lungs congested; liver very large, full of yellow points, which are found to be milium abscesses; granular and fatty changes in hepatic cells; thrombosis of some of the finer portal veins; dark bile in gall-bladder; spleen large; in pancreas a few yellow foci; lungs congested.	No autopsy. The marked gastric symptoms and the occurrence of ascites are remarkable features of this case, which was probably one of pyelophlebitis.
				Case II. Blood infection, probable parenchymatous change in liver.	Icterus eighteenth day of disease; repeated chills; marked fluctuation between morning and evening temperature; liver enlarged; whole region sensitive; vomiting and epigastric pain; profuse sweats; no albumin in urine; ascites; congested lungs, oedema of lungs.	.....	.....
				Case III. Probable parenchymatous change.	Jaundice on fifteenth day, preceded by chill on thirteenth; abdomen sensitive, especially liver region over left lobe; liver increased in size; urine contains bile-pigment, no albumin; chills recur. Patient left the hospital improving, but still jaundiced; the liver and spleen were still swollen after nearly four weeks.	.....	.....	Though not specifically stated, it is likely that this patient recovered.

14	Sabourin	Revue de Méd., 1882, p. 600.	1	Parenchymatous change (acute yellow atrophy).	Case IV. Cholecystitis, with cholangitis; interstitial hepatitis. Jaundice on second day of a typhoid fever relapse; jaundice preceded by chills; liver enlarges, becomes tender on pressure; bilious stools, subsequently yellow; repeated chills; apparent recovery, except slight jaundice and enlarged liver remaining. Returns to hospital, a little over a month after leaving it, with oedema of lower extremities; yellowish liquid stools; urine full of bile-pigment; general dropsy develops, with hydrothorax and ascites, and abdomen is tapped; dies of oedema of the lung after a lingering illness.	.....	Cleartized Peyer's patches; thickening of mucous coat of gall-bladder; peritoneal adhesions between stomach and liver; liver small, surface granular; biliary ducts in liver filled with brownish-yellow masses, some containing spear-shaped concretions, others fibrinous coagula; some of the smaller bile-ducts have undergone obliteration with increase of connective tissue; this process also spread to Glisson's capsule, and led to atrophy of the liver; thus interstitial hepatitis had occurred following inflammation of gall-bladder and bile-ducts; choledithiasis accedens is also recorded. In intestines ordinary typhoid fever lesions; heavy congestion of lungs; liver diminished in size in a state of acute atrophy with fatty degeneration of the hepatic cells; gall-bladder contained a small amount of almost healthy-looking bile.	This case is not free from doubt as one of typhoid fever. Death occurred on the eighteenth day, and Peyer's patches should then have shown ulceration.
15	Stedman	Med. and Surg. Rep., Boston City Hospital, 3d ser., 1882.	1	Parenchymatous change in liver.	Jaundice probably early in second week; tenderness in right hypochondrium; no epistaxis, nausea, or vomiting; urine, besides bile-pigment, contains a trace of albumin; diarrhoea, hypostatic congestion of lungs; highest temperature recorded 102°.	Died.	Liver enlarged and of nutmeg appearance; Peyer's patches swollen, not ulcerated; spleen softer but small; kidneys enlarged and in a state of cloudy swelling.	Death in middle of fifth week.
16	Freundlich	Deutsch. Arch. f. klin. Med., 1883, Bd. xxxiii. p. 318.	1	Blood infect'n; pyæmia.	Jaundice early in fifth week of typhoid fever, in which thrombosis of the scrotal veins followed by gangrene there and in the inguinal region had arisen; repeated chills; in the progress of the case persistent albuminuria and intestinal hemorrhages.	Died.	Anatomical lesions of enteric fever in intestines; double croupous pneumonia of lower lobes; condition of liver not stated.	Very doubtful case, in which at end of the second week temperature became 38° C. Was it abortive typhoid followed by a relapse?
17	Mathieu	Revue de Méd., July, 1886, vol. VI. p. 633.	..	.....	.....	.....	.....	.....

No.	Author.	Reference.	No. of cases.	Probable cause of jaundice.	Marked associate symptoms.	Result.	Post-mortem appearances.	Remarks.
18	Sorel	Bull. et Mém. de la Soc. Méd. des Hôp. de Paris, 1889, vol. vi. 3d ser., p. 224.	6	Cannot judge from slight description.	Four cases happened at beginning of the malady, two of which were fatal; one case jaundice shortly before death; one in convalescence. In one case, p. 239, epistaxis was frequent.	3 died. 3 recover	.....	No particulars given, except that in one case in which there had been also bloody urine, the liver was said to have been altered.
19	Romberg	Berlin. klin. Wochenschrift, March, 1890.	1	Blood infect'n; thrombosis of vena porta, and small liver abscesses.	Intestinal hemorrhage; albuminous urine; chill on twenty-fourth day of the disease; next day jaundice; brownish or yellow soft stools, sensitive abdomen, increased liver dulness and tenderness in hepatic region; fever with irregular remissions; icterus became intense; repeated chills. Death on thirty-first day of disease.	Died.	Many typhoid ulcers, for the most part in the process of healing; phlegmonous suppuration in mesentery near cecum; thrombi in ilio-caecal veins and its branches; liver markedly enlarged and full of small abscesses, especially of left lobe; masses of staphylococci in thrombi in portal veins.	
20	McPhedran	Canadian Practitioner, March, 1891.	1	Blood infection and parenchymatous change (diffuse pylophlebitis).	Symptoms came on, in a man, as convalescence was about to set in; temperature became irregular; recurring chills with sweating; jaundice; increase of liver dulness. Subsequently signs of chronic peritonitis.	Died.	At autopsy, diffuse pylophlebitis and chronic purulent peritonitis found; in the mesentery a small abscess apparently originating in a mesenteric gland.	
21	Jamieson	Imperial Maritime Customs, China Med. Reports, 1888-95, 37th issue, pp. 63, 67.	9	Blood infection with probable parenchymatous change.	Jaundice appeared in one case on the fifth day, in one on the eighth, in three on the tenth, and one respectively on the eleventh, fourteenth, seventeenth, and forty-fourth days; deep jaundice in all, and symptom not of gradual onset.	4 died. 5 recover	.....	Four of the five cases in which jaundice appeared before the eleventh day proved fatal. Severe intestinal hemorrhage occurred in three of the fatal cases.
22	Lannois	Rev. de Méd., 1895, p. 911.	1	Parenchymatous change; cholecystitis.	Icterus began toward third week of severe typhoid fever; at first light, it became very intense, black; liver greatly enlarged, marked meteorism, intense pulmonary congestion. Death eleven days after appearance of icterus; not long before, a superficial abscess appeared on back of hand, and one on the internal surface of the leg on the same side.	Died.	Many Peyer's patches involved. Enormous liver, weighing 3000 grammes, yellow and fatty; gall-bladder greatly distended, containing, besides a clear liquid, flocculent mucopus; superficial erosions in membrane; biliary passages, no ulceration or abscesses.	This is a very marked case of suppurative cholecystitis.

23	Osler	Transactions of Association of American Physicians, 1897.	2	Catarrhal in first case; blood infection (with paren- chymatous change?) in second.	In the first case nausea and vomiting came on early in a relapse of typhoid fever, of which the original attack was one of moderate severity; jaun- dice appeared fourth day of relapse; no enlargement of liver; tenderness on deep pressure in front of tenth rib; nausea and vomiting prominent symptoms; profuse sweats; clay-col- ored stools; temperature range from 102° to 103.5°. In second case severe attack of typhoid fever; jaundice at end of second week; jaundice be- came of considerable intensity; mete- orism; abdomen not tender; liver dulness not decreased; marked de- lirium; nystagmus; temperature, which had been high (103°), dropped to 97.2°.	1 recov 1 died.	.....	In the second case the pa- tient died on the sixteenth day. It was remarkable that, notwithstanding a fall- ing temperature for four days, the pulse was of good volume.
24	Da Costa	Present paper.	5	1 catarrhal; 1 pyelophlebitis; 3 parenchyma- tous changes in liver with blood infect'n.	Detailed in present paper. Jaundice marked in all.	3 died. 2 recov	.....	All were severe cases of typhoid fever.

Viewed in its clinical bearings, we find abscess of the liver in typhoid fever under these conditions: as metastatic abscess, due to a pyæmic infection from other parts of the body, as the consequence of pyelophlebitis, which is nearly always caused by an infection from typhoid lesions in the intestine, or from suppurating mesenteric glands and a resulting infective thrombosis; or, as owing to typhoid ulceration in the biliary passages and secondary suppuration. The first of these causes is illustrated by most of the cases in the table, notably by those of Louis, of Chvostek, of Sidlo, of Dunin,¹ of Barth.² To the second category belong the cases of Lannois, of Osler, of Romberg, of Gerhard,³ of Tüngel,⁴ in which pus from a suppurating lymphatic gland near the cæcum broke into a root of the superior mesenteric vein; of Bückling⁵ with a similar history; of Asch and Bernhard,⁶ where there was also a suppurating mesenteric gland. Cases belonging to the third group are the rarest. A very striking one is mentioned by Klebs,⁷ in which a suppurative inflammation of the bile passages within the liver happened, and their dilatation formed abscesses filled with thick, greenish, muco-purulent liquid. In the pus from liver abscesses, typhoid fever bacilli were found by Lannois. It may be also a question whether in some of the cases regarded as metastatic there have not been separate foci of inflammation and suppuration due to the typhoid bacilli; for instance, in the cases in which the parotid glands, as well as the liver, have been implicated.

In this connection we may discuss whether there be a form of typhoid fever in which liver symptoms arise, including jaundice, owing to the direct action of the specific micro-organisms on the liver or the bile channels. Mathieu⁸ describes, under the title of "typhus hepatique benin," a case which he believes to have been of this character, and in which a relapse similar to a typhoid fever relapse happened, and Pfuhl⁹ cites nine cases that came on after swimming repeatedly in a swimming school in the infected Elbe water at Altona near Hamburg, and all of which had fever and jaundice. I have analyzed these cases, and do not find their clinical history closely corresponding to typhoid fever. They all recovered, and are spoken of as due to mixed infection. Mathieu's case also recovered; and, as these cases happened before the introduction of the Widal test, we must remain in doubt as to their nature. I had at the Pennsylvania Hospital last year a case of jaundice in a colored woman (Case No. 2775), with fever, violent epistaxis, hebetude, diarrhœa, and albuminous urine, in which the

¹ Deutsch. Arch. f. k. Med., 1886, Bd. xxxix. p. 379.

² Bullet. de la Société Anat., 1853, p. 80.

⁴ Thierfelder, Ziemssen's Handb., Bd. viii. p. 84.

⁵ 36 Fälle von Leberabscess, Berlin, 1863.

⁷ Handbuch der Pathol. Anat.

⁹ Deutsch. Milit. Arztl. Zeitsch., 1898, vol. xvii. pp. 9, 10.

³ Loc. cit.

⁶ Loc. cit.

⁸ Revue de Méd., July, 1886.

Widal test gave positive reactions. She had been suffering with fever for two weeks, and it preceded the jaundice. The case proved fatal in the third week of the disease, and seemed to be an undoubted one of typhoid fever with hepatic complication. At the autopsy no lesion was found in the intestinal glands. The mesenteric glands were here and there enlarged, and one appeared as if it had pressed upon the choledoch duct; the gall-bladder was much distended, and its mucous coat inflamed; the liver was small and in a high state of fatty degeneration; the spleen was small; the kidneys large, with signs of interstitial nephritis. Unfortunately, through a misunderstanding, no cultures were made from the liver and gall-bladder, as had been intended, and, notwithstanding the positive character of the Widal test, I hesitate greatly to bring forward the case as one of hepatic typhoid without intestinal lesion; it may have been one of acute yellow atrophy, of which it presented also many of the symptoms.

More common in typhoid fever than diseases of the liver itself are the diseases of the bile passages. We know through recent researches how frequent is their infection, especially the gall-bladder infection, with the typhoid bacilli. Chiari¹ reports the results of autopsies in twenty-two patients, and only in three was the bacillus absent from the gall-bladder. In twelve cases there was inflammation of the mucosa alone; in one the whole wall was affected, causing peritonitis.² In the discussion that followed a valuable paper by Mason,³ on "Gall-bladder Infection in Typhoid Fever," Councilman stated that he had found the typhoid bacillus in nearly every case. Gilbert and Girode⁴ demonstrated the presence of the typhoid bacillus in suppurative cholecystitis. Dupré⁵ got pure cultures of typhoid bacilli from the gall-bladder of a patient operated on for gallstones six months after typhoid fever; in another case, in a man who died about the fifteenth day of typhoid fever, although the gall-bladder presented no obvious pathological changes, pure cultures of Eberth's bacillus were obtained.

Not only do these gall-bladder infections happen in the course of typhoid fever in association with the characteristic intestinal lesions of the disease, but they have been observed when these are absent. Cases of the kind are reported by Guarnieri⁶ and in a most interesting paper by Osler.⁷ Mark Richardson's⁸ case, in which there was no distinct history of typhoid fever, but in which the typhoid bacillus was found in the fluid obtained from the distended gall-bladder by operation, is

¹ Eleventh Intern. Med. Congress, Zeitschr. f. Heilkunde, 1894, Bd. xv. S. 199.

² Case described, Prager med. Wochenschrift, 1893, No. 22.

³ Transactions Assoc. American Physicians, 1897.

⁴ Mém. de la Soc. de Biologie, 1890 and 1893.

⁵ Infections Biliaires, 1891.

⁶ Contrib. alla patog. della infez. biliari.; also, Baumgarten's Jahresbericht, 1892, S. 234.

⁷ Trans. Assoc. American Physicians, 1897.

⁸ Boston Medical and Surgical Journal, December 16, 1897.

another case in point. It is quite as likely that the infection of the gall-bladder occurs in these instances through the typhoid bacilli in the blood as by direct infection from the continuous intestine. Further, great interest is attached to these gall-bladder infections in typhoid fever from the now established fact that they lead to the formation of gallstones; as, on the other hand, gallstones seem to invite the bacillary infection to the gall-bladder. The association with gallstones is curiously illustrated in a case by Chantemesse,¹ in which living typhoid bacilli were found in a gallstone removed by operation eight months after an attack of typhoid fever. Van Dungern's² case of bacilli found fourteen years and a half after typhoid fever in the pus from an abscess formed around the gall-bladder is unique; here, however, no stones were detected. The patient recovered.

Now, from the frequency, it might almost be said constancy, with which infection of the gall-bladder happens in typhoid fever, it would be supposed that symptoms referable to it are very common. But it is just the reverse. In the cases of irritation or the lighter cases of inflammation produced by it, there are absolutely no symptoms; even in the more severe cases, in which obvious lesions are found, symptoms are often absent or, at least, not recognizable; and thus the majority of cases pass undiscovered and mostly unsuspected. It is only the very marked ones, and chiefly those in which perforation has happened, that have been noticed. I shall attempt an analysis of such of the cases as have been published with sufficient fulness to give real information, and which seemed to me to be undoubtedly linked to typhoid fever, for it is astonishing in how many instances the evidence concerning this is most meagre. I have been greatly aided in the task by the courteous permission of Dr. Westcott to make use of the references he had prepared for the remarkable work of Dr. Keen, *On the Surgical Complications and Sequelæ of Typhoid Fever*, and by the most efficient assistance of Dr. Woodbury. After rejecting all the doubtful cases, I got together and tabulated fifty-three cases of cholecystitis in typhoid fever, some simple though marked, some suppurative, some perforative. But before analyzing these, it may be well to inquire in what proportion these affections have been noticed by pathologists, irrespective of, as well as with, typhoid fever. Courvoisier³ gives us valuable information on this point. Of 16 cases of cholecystitis of catarrhal origin or with beginning suppuration, fully 5 occurred in the course of typhoid fever. Six cases out of 55 of empyema of the gall-bladder were due to infection, one of which was from typhoid; 41 were due to cholelithiasis. In 7 cases of phlegmonous infiltration of the walls of the gall-bladder, typhoid was twice the cause, and the other 5

¹ *Traité de Méd.*, Tome 1, p. 764.

² *Münch. med. Wochenschrift*, 1897, No. 26.

³ *Casuist. Statistishe Beiträge z. Path. u. Chir. der Gallenwege*, Leipzig, 1890, pp. 76-94.

cases were due to cholelithiasis. Fatal result is the rule in purulent cholecystitis. Of 82 cases, 53 proved fatal. Among these were 10 cases due to typhoid. In many of the cases there was no suspicion of cholecystitis prior to the autopsy. In cases of perforation of the gall-bladder, with encapsulation into the abdominal cavity, mentioned by Courvoisier, there were four in which no calculi existed, and which were due to typhoid.

Cholecystitis in typhoid fever, when at all marked, is a grave complication, no matter what be its exact form. In 58 cases of typhoid cholecystitis I have collected, there were 39 deaths and 15 recoveries, while in 4 the result was uncertain or not stated. Of the different forms, the instances of perforation without operation are the most fatal; 1 only out of 24 recovered by a discharge through the abdominal walls (case of Salzman); 3 recovered after operation (cases of Alexieef, Williams and Shield, Osler and Halsted). In suppurative cholecystitis there are a number of recoveries, but also as the result of operation (cases of Caspersohn, Mason, Richardson, Williams and Shield, Osler and Halsted). In the cases of cholecystitis which are catarrhal, recovery is not infrequent; where there is also cholangitis (as in Case IV. of Petrina and in Sander's case), the prognosis is not good. But Griesinger's case, in which this complication probably existed, recovered.

To proceed now with the clinical analysis of the 53 cases I have collected, to which, for some purposes, I shall add the 5 of cholecystitis with jaundice detailed in the table printed in this paper. Of these 58 cases there were 22 in which perforation of the gall-bladder happened. In 6 of the 22 cases of perforation gallstones were found, while in 16 they are either stated to be absent or are not mentioned; thus gallstones were not encountered in more than about one-fourth of the cases of perforation. Suppurative cholecystitis may, from the descriptions, be recognized in 24 of the 58 cases; and in eight of these was also perforation. In the other instances the lesion was catarrhal, with very slight if any suppurative change. Ulcers of the gall-bladder cannot be absolutely separated from suppurative cholangitis, as in nearly all instances some suppuration coexists.

As regards *sex*, there is very little difference in the occurrence of the marked gall-bladder complications of typhoid fever. In 48 cases in which the sex is mentioned 26 were males, 22 females. The affections may be met with at almost any *age*. In 48 cases 8 were twelve years of age or less; 40 cases were over twelve years of age. The youngest case happened in a girl, aged five years (case of Alexieef¹); the oldest in a man, aged sixty-seven years (case of Anderson²).

¹ Journ. Dietskaya Med., 1896, No. 4; abstracted in THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, October, 1897, p. 466.

² Medical News, August, 1896.

The question of the *diagnosis* of these gall-bladder complications, and the possibility of telling them apart, is of great importance. It has been stated already that in many instances they are latent, and have only been discovered after death. But the knowledge of their occurrence, and the search for them in acute cases, will cause them to elude discovery less and less frequently. The marked symptoms are pain and tumor.

Pain is almost never absent. It is epigastric, or in the right hypochondrium, and is very often referred directly to the seat of the gall-bladder. It may be so severe that the patient shrieks, especially when he moves (as in Budd's case), or rolls in agony (Barthez and Rilliet's case). It often occurs in severe paroxysms. In the great majority of instances it is associated with marked tenderness, which, however, is not apt to remain confined to the region of the gall-bladder, but to be found also over the whole of the right hypochondrium or right side of the abdomen; and the entire abdomen even may be sensitive, most likely then from a spreading peritonitis. On the other hand, the general tenderness may become localized in the region of the gall-bladder. In a few instances sensitiveness, without pain, is spoken of; in a very few, as in a case of Louis', pain is mentioned as absent. Rigidity of the abdominal walls, especially on the right side, not infrequently coexists.

Tumor is of diagnostic significance as great as or even greater than pain, though it is not so common a symptom. It is specially mentioned in 21 out of 53 cases, only, therefore, in less than one-half. But it is probably present in larger proportion; the typhoid state of the patient and the marked meteorism that generally exists prevent its detection. It occupies the seat of the gall-bladder, and is thus to be looked for at Mayo Robson's¹ point, namely, at the junction of the upper two-thirds with the lower third of a line drawn from the ninth rib to the umbilicus. In a number of instances it is described as pear-shaped and firm, also as being tender on pressure; it may be a mere resisting mass below the costal margin. The tumor of the gall-bladder may be noticed to disappear slowly, or, where perforation happens, the disappearance may be sudden. In some instances the tumor swells up from time to time, as in the remarkable case of Leudet,² in which a woman who left the hospital apparently well, though with signs of a tumor from typhoid cholecystitis still perceptible under the false ribs, had markedly recurring swelling with tenderness at each menstrual period for six months. The tumor that is found, though having its origin in the lesion in the gall-bladder, may not be due to this viscus strictly speaking, but, in the perforated cases, be a pus-

¹ Diseases of the Gall-bladder and Bile-ducts, 1897, p. 37.

² Clinique Médicale de l'Hôtel Dieu de Rouen, 1874.

cavity formed around it. The history of the case and the irregular shape of the swelling may lead us to suspect its cause, but there is no certainty in the discrimination.

Among the less marked symptoms are jaundice, nausea and vomiting, and chills. *Jaundice* occurred in 17 out of 58 cases, was thus absent or not mentioned in 41, and only occurs, therefore, in less than one-third of the cases. It is not, as a rule, deep, though, after it shows itself, it persists. It does not occur in the cases with perforation in any greater proportion; 5 only out of the 23 cases of perforation had jaundice. Nor is it of much more frequency in the suppurative cases, the proportion being 6 out of 24. Indeed, its relation to the gall-bladder lesions in typhoid fever is uncertain and of little value in diagnosis. In rare instances the jaundice is due to impaction of a gallstone, as in the case of Barbe,¹ in which attacks of gallstone colic and steadily deepening chronic jaundice preceded typhoid fever; and, at the autopsy, besides the characteristic intestinal lesions, a perforated gall-bladder was found and an obstruction of the common choledoch duct by a stone.

Nausea and *vomiting* occur as transient symptoms, though in much greater frequency than in the ordinary course of typhoid fever. They are mostly to be noticed at the beginning of the gall-bladder complication. In Legendre's² case the vomiting of large quantities of green, bitter fluid is specially mentioned. *Chills* are conspicuously absent. I find their occurrence noted in only 3 out of 54 cases, including the cases in which perforation happened. Burger's³ case began with a severe chill; chills happened six days before death in Budd's⁴ case, and happened also in one of Osler's cases. The other symptoms are those of severe cases of typhoid fever. But the frequent occurrence of pulmonary complications, especially toward the end of the fatal cases, is noteworthy. In a number of instances pneumonia was the immediate cause of death.

As regards the diagnosis of typhoid cholecystitis, this is impossible with any certainty, except where tumor is present, though it may be suspected if there be nausea and vomiting, a sense of weight, and sensitiveness over the gall-bladder. But the occurrence of tumor and of pain and tenderness at or near the seat of the gall-bladder make the diagnosis not difficult. The most likely error is confounding the malady with an appendicitis. As a rule, the seat of pain and tenderness and swelling is different; in the one case in the right iliac fossa, in the other in the region of the gall-bladder. But we cannot trust implicitly to this; as in appendicitis, especially at its upper part, or

¹ La France Méd., 1884, ii. p. 1071.

² Bull. de la Société Anatom. de Paris, 1881, p. 1893.

³ Deutsch Arch. f. k. Med., 1873, p. 623.

⁴ On Diseases of the Liver, 3d ed., 1857, p. 196.

where the appendix is not normally situated, the localization of the symptoms may be high up; and in cholecystitis the pain and tenderness may not be most marked over the gall-bladder, and the swelling may be very difficult to define.

An exact discrimination of the different forms of typhoid cholecystitis cannot be always made. They are all most likely to come on late in the disease, or after convalescence has been established, and all, whether with or without perforation, as Hagenmüller¹ has clearly established, are prone to be associated with local peritonitis in the neighborhood of the gall-bladder. Where there are abscesses in other parts of the body, and we can exclude pyelephlebitis and hepatic abscess, a *suppurative cholecystitis* may be inferred, if pain and tumor be present. If there be a history of biliary colic and gallstone, or if this arise in the progress of typhoid fever or not long subsequent to it, signs of cholecystitis mean suppurative cholecystitis. I think, too, though there are not many observations on this point, that examinations of the blood will help us materially. We know through the researches of Thayer² that in typhoid fever the number of white blood-corpuscles varies but little from the normal standard, about 6000 per c.cm. Marked leucocytosis, if there be symptoms of cholecystitis, points to its being suppurative, as in Mason's case and in Anderson's case, where there was perforation. On the other hand, in a case of Osler's that recovered, there was no leucocytosis, and we may infer the cholecystitis not to have been purulent. In laying stress on leucocytosis we must, however, exclude abscess of the liver, in which condition it may also exist. Yet here the local symptoms are different: there is less pain, no tumor over the gall-bladder, and in doubtful cases I should attach much importance to the occurrence of chills. The analysis in this paper has proved their extreme rarity in cholecystitis of any form, whereas they are very common in abscess and in pyelephlebitis, as is sweating. In none of these conditions can we lay much stress on the presence or absence of jaundice. There are cases of gall-bladder affection in typhoid fever in which there is mere distention with bile or a watery fluid. Case IV. of this paper probably belongs to these. They have been supposed, as in the case of Dumoulin,³ to be due to retention of bile owing to nervous disturbance attending the fever, analogous to the retention of urine; or they may be the result of obliteration of the cystic duct, as in a case of Louis,⁴ where the bile in the distended gall-bladder had the appearance of urine, and the cystic duct was compressed by an enlarged lymphatic gland that surrounded it. No means exist of distinguishing these cases during life from acute cholecystitis, except it be by the absence of severe pain and

¹ De la Cholecystite dans la Fièvre typhoïde. Thèses de Paris, 1876, No. 269.

² Johns Hopkins Hospital Reports, vol. iv.

³ Gaz. Méd. de Paris, 1848, p. 551.

⁴ Fièvre Typhoïde, vol. i. p. 201.

very marked tenderness. Then it is likely that they are really instances of bacillary infection of the gall-bladder, and that the typhoid bacilli will be found in the fluid, only marked inflammation has not been induced.

Perforation of the gall-bladder has as its chief symptoms suddenly developed or intensified pain, collapse, and peritonitis. In some instances that have been reported there is also marked drop of temperature, as in the cases of Bonamy¹ and of Bond.² The effect on the tumor is often a decided lessening or a disappearance. Peritonitis, which may remain local, as in the case of Hawkins³ and others, develops, and may lead to encapsulation of the discharged contents of the gall-bladder. On the other hand, a subsequent general peritonitis may occur. The course is often a comparatively slow one, two of the reported cases, Ranvier's⁴ and Archambault's,⁵ not dying until the twelfth day after the perforation.

It is evident how very similar the symptoms are to those of intestinal perforation. Gall-bladder perforation can be, indeed, distinguished only by the seat of the pain and the previous existence of the tumor. Should jaundice be present it would be an additional aid in discrimination. On the other hand, intestinal hemorrhages preceding the symptoms of perforation, and rapidly developing general peritonitis, belong more strictly to the intestinal lesion; local peritonitis in the upper part of the abdomen on the right side is more characteristic of gall-bladder perforation, as is a slower progress of the symptoms. Fall of temperature, too, attending the collapse, occurs much oftener in intestinal perforation in typhoid fever than in gall-bladder perforation in the same disease.

The *treatment* of the jaundice attending these different hepatic affections will be guided by our recognition of the probable cause. Those which are due to blood infection and to the finer parenchymatous changes in the liver cannot be reached by any special treatment, which must be that of the grave underlying typhoid condition. I will, however, point out that two of my cases recovered while taking decided doses of mineral acids, and this was also the result in two of Murchison's cases. In abscess of the liver, as well as in pyelephlebitis, large doses of quinine may be employed. In the ordinary form of cholecystitis, recovery has followed applications of leeches over the swelling, followed by poultices, as in Observation No. LXVIII. of Frerichs. Besides the general treatment of the typhoid state, attention must be paid to the character of the discharges from the bowels; when very dark and showing vitiated bile, small doses of mercurials should be given. Leudet's⁶ case got well under calomel and under frictions with belladonna.

¹ Gaz. Méd. de Nantes, 1890, p. 133.

² British Med. Journ., July 12, 1884, p. 67.

³ Medico-Chir. Trans., vol. lxxx. p. 138.

⁴ Bull. de la Soc. Anat., 1864, p. 433.

⁵ Bull. de la Soc. Anat., 1852, p. 90.

⁶ Loc. cit.

The suppurative cases require support, and, as soon as we are reasonably sure of their character, surgical interference, the admirable outcome of which was seen in the cases of Caspersohn,¹ of Williams and Shield,² of Alexieef,³ of Mason,⁴ of Osler and Halsted,⁵ of Mark and Maurice H. Richardson.⁶ Among the perforation cases I know of only one recovery without operation, the case of Salzman,⁷ which discharged through the abdominal wall. An operation alone promises success, and how well it may succeed is proved by the results of Williams and Shield and one of the cases of Osler and Halsted.

THE SIGNIFICANCE OF ALBUMOSURIA IN MEDICAL PRACTICE;
SUGGESTED BY A FATAL CASE OF ALBUMOSURIC MYXŒ-
DEMA TREATED WITH THYROID EXTRACT.⁸

BY REGINALD H. FITZ, M.D.,
OF BOSTON.

THE following case of myxœdema is reported more particularly for the purpose of calling especial attention to the presence of a symptom which, with but a single exception, so far as I am aware, has hitherto been unrecorded in this disease except as a mere statement of fact in the *Practice of Medicine*, by Wood and Fitz. The patient therein referred to was seen by me in consultation with Dr. M. L. Chamberlain, of Boston, to whom I am indebted for permission to give the following account and for information concerning the progress of the malady.

The case is of further interest, if not importance, in showing that the prognosis of myxœdema still may be grave despite the immediate and repeated benefit so generally resulting from the use of thyroid preparations.

I first saw Mrs. — November 17, 1895. She was fifty-three years of age, and had lived the greater part of her life in Vermont. The last two years had been spent in California. She never had been pregnant.

As a girl she suffered considerably from discomfort referred to the stomach, in the region of which there would be a sense of distention for a day or two at a time. Cramps would occur suddenly, and tenderness along the spine was complained of. With these exceptions she en-

¹ Festschr. f. Fr. von Esmarch, 1893, p. 455, Kiel and Leipzig.

² Lancet, March 2, 1896.

³ Journ. Dietskaya Med., 1896, No. 4. Quoted in THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, Oct., 1897, p. 466.

⁴ Trans. Assoc. American Physicians, 1897.

⁵ Ibid.

⁶ Boston Med. and Surg. Journ., December, 1897.

⁷ Med. Corresp. Würtemb. Arztl. Verein., 1870, xl. 84.

⁸ Read at the annual meeting of the Association of American Physicians, Washington, D. C., May 3, 1898.

joyed good health throughout the greater part of her life, recalling to mind solely an operation for anal fistula when she was about forty-seven years old.

At the age of forty-nine, while in Vermont, she observed a gradual loss of flesh, strength, and color. A year later, when tired, would feel a griping sensation in the back of the neck and a pain between the shoulders. These discomforts were noticeable especially on going down hill. There was also a temporary stiffness of the joints in the morning. At this time the eyelids were slightly swollen and an increased flow of saliva began, a symptom which has continued since, and persists at present.

In the following year, 1893, while in California, the joints again became appreciably stiff, and she felt a sense of numbness in the right heel, in the knees immediately above and below the joint, and in the fingers of the right hand. In 1894 the stiffness diminished somewhat, but the numbness persisted. In the fall of this year the teeth were troublesome and, despite the care of a dentist, became painful, and since have remained in this state. An upper canine tooth is said to have extended into the bone one-fourth of an inch. There was a metallic taste in the mouth, and she became unable to masticate resistant food, being obliged to live upon soft articles of diet. Walking now caused so much fatigue that she was obliged to give up active exercise. The griping at the back of the neck and the pain between the shoulders continued to be annoying at times, and she suffered also from wakefulness.

In January, 1895, superficial swellings first were noticed. They appeared as an enlargement of the back of the neck, a lump beneath the jaw, hypertrophy of the tongue, and, later, indurations in the legs and arms. At first the swellings would vary temporarily in size, and that in the neck would lessen somewhat under the influence of fomentations; but later the enlargement remained constant. The voice was now changed, and the increased flow of saliva became a more or less constant drooling. In the course of a few months, in consequence of a loose molar tooth, the jaws were prevented from closing. The tooth was extracted, but the jaw and the neighboring portion of the tongue became sore and, finally, a fragment of dead bone was removed.

At the time of my first visit Mrs. — was unable to walk, on account of muscular stiffness. There was no evidence of mental impairment, nor had such been observed by her friends. Her face was pale, moderately swollen, and expressionless from partial effacement of wrinkles and furrows. In sharp contrast was the elevation of the eyebrows and wrinkling of the forehead from apparent tension of the occipito-frontalis muscle. The upper eyelids were relatively normal, but the lower lids were somewhat puffy. The lips were slightly thickened and everted, the surface roughened. Especially conspicuous was the greatly enlarged and resistant tongue, filling the partially opened mouth. The dorsum of the tongue was dry, although the flow of saliva was constant. The submaxillary region was prominent, presenting the appearance of a double chin, and both submaxillary salivary glands were greatly swollen and dense. The back of the neck was smooth and much swollen, like that of a very obese person, but was dense and resistant to the touch. It measured from sixteen and one-half to seventeen and one-half inches in circumference. The hands and feet were cold. The skin covering the back of the hands was thickened, coarsely wrinkled, the surface being rough and of a dirty-

yellowish tint, the whole appearance suggesting that of a fowl's claw. The skin covering the front of the chest and abdomen was normal, but that of the forearms, legs, feet, back, and buttocks was pale, dry, smooth, tightly drawn, not displaceable from the subjacent structure in consequence of the resistance of the subcutaneous tissue. The anterior wall of the vagina was smooth, thickened, and dense like the abnormal portion of the skin. There were no supraclavicular swellings. The hair was coarse and dry, but the nails were normal in appearance. The thyroid gland was not palpable. Nothing abnormal was found on auscultation and percussion of the chest and on palpation of the abdomen. The temperature was 98.4° F. The examination of the blood by Dr. R. C. Cabot showed 5,030,000 red corpuscles, 11,600 leucocytes, and 35 per cent. of hæmoglobin. The differential count gave 74 per cent. of polynuclear leucocytes and 23 per cent. of lymphocytes.

On the addition of nitric acid to the urine a dense, white precipitate was formed, occupying nearly one-half the volume of urine. The precipitate was dissolved when the specimen was boiled, but reappeared on cooling. When the urine in a test-tube was boiled it became opaque until the boiling-point was reached. It then became clear, and thus remained until the liquid was cool, when a white precipitate formed. Under the microscope a few red blood-corpuscles and an occasional hyaline and granular cast were seen.

The dissolving of the nitric acid precipitate by heat and the formation of a white precipitate when the boiled urine was cooled led me to suspect the presence of albumose, and Prof. E. S. Wood was asked to test further for this substance. He informed me that after boiling and filtering the urine to free it from albumin the clear filtrate, when acidulated with acetic acid and heated gently, became opaque, but the opacity disappeared on boiling, and a white precipitate formed when the fluid was cooled. Acetic acid and ferrocyanide of potassium gave a precipitate which dissolved when the mixture was boiled, and reappeared as the temperature fell. The biuret reaction was positive.

Professor Wood analyzed the urine from this patient repeatedly during a period of six weeks. A trace of albumin was present usually, but albumose was found constantly, by estimate varying from $\frac{1}{4}$ per cent. to $\frac{1}{2}$ per cent. December 10, 1895, a quantitative determination was made and showed 0.93 per cent. of albumose. The per cent. of urea on this day was 3.63, and the total quantity 18.66 grammes.

The diagnosis of myxœdema was made, and the treatment with thyroid extract begun, the five-grain tabloids of Burroughs, Wellcome & Co. being used. The dose of five grains on the first day was increased by one tabloid daily, but on the third day there was a sense of præcordial oppression, and the pulse became quickened. The dose then was diminished to one or two tabloids daily for a week, when it again was raised to three five-grain tabloids in each twenty-four hours.

I saw Mrs. — a second time December 10, 1895, a little more than three weeks after my first visit. The change in her appearance had greatly improved, although previous to the use of the thyroid extract her condition was steadily deteriorating. At the end of the first week of thyroid treatment the œdema suddenly left the eyelids, but a watery œdema, pitting on pressure, appeared and persisted in the feet. The flow of saliva diminished, the swollen tongue became smaller, and the

pain in the shoulders was less disturbing. In the third week of treatment the swelling of the neck and of the submaxillary glands was noticeably lessened, and the expression of the face became more mobile. The weight at the beginning of the thyroid treatment was one hundred and twenty-five and one-half pounds, and there had been a loss of about three pounds each week. The quantity of urea eliminated increased from eleven to sixteen grammes. The appetite was unaffected, but the pallor and debility were greater than when first seen. The pulse varied between 83 and 107 beats per minute, and the temperature remained in the vicinity of 99.7° F.

It was considered desirable to continue the use of the thyroid extract under careful supervision, that cardiac weakness might not prove a source of danger. The especial discomforts produced by it were fleeting pains in the muscles or in one joint or another, præcordial constriction, and a choking sensation, all more likely to occur at night when the greatest quantity of the thyroid preparation had been taken within a limited number of hours.

Preparations of iron, arsenic, manganese, strychnine, digitalis, and nitroglycerin were given from time to time as the indications for their use were apparent. On account of the progressive weakness of the patient, despite the early improvement in the surface manifestations, the thyroid preparations were discontinued from time to time.

At a third visit, February 25, 1896, Dr. C. F. Folsom also saw the patient. At this time, although the expression was brighter, she was pale, weak, and emaciated. The especial improvement was in the condition of the skin, which was smooth, moist, and free from the yellow discoloration so marked at the outset. The hands were warm, the hair was moist and less bristling, but the brawny induration of the back of the neck and the swelling of the tongue and submaxillary glands had not materially diminished in the previous two months. It was decided to continue the use of the thyroid, and from seven to nine grains were daily given for a week, during which time the pulse was about 100 and the temperature varied from 99.3° to 100.4° F. A sudden severe attack of præcordial pain then occurred, and the use of the thyroid was discontinued for four weeks. During this time the pulse fell to the normal and became stronger, the salivation lessened, the weight increased somewhat, but the tongue felt as if it was somewhat enlarged. The thyroid extract was then given in one-grain doses, and, for greater convenience in supervision and care, Mrs. — entered the Boston City Hospital, where she came under the charge of Dr. Folsom, to whom I am indebted for the report of her further progress.

She was admitted to the hospital April 18, 1896. The circumference of the neck then was fifteen inches, the tongue was about four inches wide and one inch thick. The head could not be bent backward, nor could the chest be touched with the chin. The hands and feet were cold, the skin was smooth, and the hair moist. The blood examination showed 84 per cent. hæmoglobin, 4,532,000 red corpuscles, and 10,500 leucocytes. The patient received one grain of thyroid extract daily, but she gradually became weaker, took little nourishment, decidedly failed on April 26, and died early on the following day. There was no autopsy.

There having been some difference of opinion among the physicians who saw this patient as to the exact nature of the disease, the reasons

for the diagnosis of myxœdema may be summarized. There were present "the firm swelling of the skin, not pitting on pressure, inelastic, adherent to the parts beneath, and not affected by gravitation; the dryness and roughness of the skin, tending, with the swelling, to obliterate all lines of expression; the imperfect nutrition of the hairs . . . the local tumefaction of the skin and subcutaneous tissue noticed in various parts of the body . . . an affection of the teeth homologous with that of the hairs just mentioned; the remarkable physiognomy; the slow . . . monotonous voice . . . and elimination or apparent absence of the thyroid gland." These are among the characteristics of myxœdema described in the *Report of the Committee of the Clinical Society of London*, 1888 vol. xxi., Supplement, p. 178. The mental impairment and subnormal temperature alone are lacking to complete the picture. But mental disturbances were absent in twenty-seven out of forty-six cases tabulated by the committee.¹ The temperature was normal in eight cases, and in a few was 99.6 F., or even higher, though never above 100° F. The swelling in the back of the neck was duplicated in Dr. Ord's case, No. 87, in which there was a "swelling at the back of the neck over trapezius, so that he cannot bear to wear a collar." Salivation was present in three of the committee's cases, and the submaxillary gland of Hale White's cases² showed marked changes. A large, swollen tongue was noted in fifty-two cases.

If the correspondence in clinical characteristics is not considered as sufficient for the confirmation of the diagnosis, additional evidence is furnished by the effects of the treatment with the thyroid extract. According to Murray³ there are rise in temperature, disappearance of swelling, loss of weight, a soft, smooth, moist condition of the skin, growth of the hair, improvement in the mental condition, and increase in the elimination of urea. Her temperature became somewhat higher, and the previously cold hands were warm. The swelling diminished, there was a loss of weight, the skin became soft, smooth, and moist, and the elimination of the urea increased. A growth of hair was not conspicuous, since there was no tendency to alopecia, but a considerable improvement in its nutrition was apparent from the return of its normal characteristics.

The failure of the thyroid treatment to accomplish more marked relief is in striking contrast to the almost constant benefit derived from its use in the treatment of myxœdema. Mitchell Clarke,⁴ however, reports two cases in which thyroid treatment proved unsuccessful, and Macpherson,⁵ although causing improvement by thyroid grafting, did

¹ Report of the Committee of the Clinical Society of London, 1888, vol. xxi., Supplement, p. 14.

² Op. cit., p. 41.

³ Twentieth Century Practice, 1895, vol. iv. p. 712.

⁴ British Medical Journal, 1892, vol. ii. p. 451.

⁵ Edinburgh Medical Journal, 1892, vol. xxxvii. p. 1021.

not remove the myxœdematous condition. Byron Bramwell¹ gives an account of two fatal cases of myxœdema during or shortly after thyroid treatment. In each instance the death was sudden.

I am indebted to my colleague, Dr. E. G. Cutler, for the following summary of a fatal case under his charge.

"A patient in whom I made the clinical diagnosis of myxœdema had gradually over a period of a year and a half come into the following condition: The skin of the face, neck, shoulders, hands, arms, legs, and feet was pale and a little glossy, rather dry, much distended by a subcutaneous growth which did not pit and apparently was not fat. The wrinkles in the face were obliterated, the hair on the head had become sparse and dry, the hands and feet were much wrinkled, and the skin and nails coarse and rough. Speech was slow and peculiar. The mental condition was variable: at times the patient was rather inclined to be talkative, but the range of subjects was limited; at other times the patient would be quiet for hours and rather somnolent. Frequently there was mild delirium at night, with occasional hallucinations of sight. The patellar reflex was absent. The pulse was slow, the surface cool, and the temperature in the mouth 98° F., though no complaint of cold was made. The urine was free from albumin. The thyroid could not be made out. Toward the end there was marked tendency to somnolence. Thyroid tablets, five grains each, were given up to nine a day for two months, beginning with small dose, but with little effect. Death was sudden and apparently due to syncope."

The novel feature of my case was the albumosuria, which continued throughout the progress of the disease from the time it first was observed. Occasional or slight traces of albumin were noticed in twenty out of ninety cases, and in one a large quantity, in the series tabulated by the London Clinical Society's Committee,² in which mention was made of this condition, and in twenty-one out of one hundred and twelve cases collected by Hun and Prudden.³ Murray⁴ states that "mucin" has not been found in the urine of human myxœdema, but refers⁵ to Halliburton's discovery of an abundance of "mucin" in the urine of a sheep that developed myxœdema two years after the thyroid was removed by Horsley. Buzdyan,⁶ however, found traces of mucin, but no albumin, in the urine of a patient examined by him. The only instance of myxœdema in which I have found mention of the occurrence of albumosuria is the patient of von Jaksch.⁷ The case was one of typical Basedow's disease in which there were present a swelling of the legs, regarded as myxœdematous, and an albumosuria observed during a period of six months.

As is well known, this term is applied to the presence in the urine

¹ Edinburgh Hosp. Rep., 1895, vol. iii. p. 116.

² Op. cit., p. 21.

³ THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, 1888, vol. xcvii. p. 1.

⁴ Loc. cit., p. 722.

⁵ Loc. cit., p. 726.

⁶ Wien. klin. Wochenschr., 1891, Band iv. p. 510.

⁷ Prag. med. Wochenschr., 1892, Band xvii. p. 602.

of a peculiar substance first observed by Bence Jones¹ in 1845. As described by him, "It gave no precipitate with an excess of nitric acid unless left to stand, or unless heated and left to cool, when it became solid. This solid redissolved by heat and again formed on cooling. Continued boiling with strong nitric acid evolved but little gas, and did not quickly hinder this reaction. Hydrochloric acid gave the same solid precipitate, soluble by heat. Strong acetic acid gave only a slight precipitate, which redissolved by heat. Caustic potash and sulphate of copper gave a splendid bright-blue, clear liquid, passing over, when heated, to a claret color, . . . coagulated firmly with heat, very perfectly with a drop or two of acetic acid."

According to Maly² the product of the gastric digestion of albuminous substances was designated albumose by Mialhe in 1846, but subsequently Lehmann named it peptone. Meissner and his pupils, in a series of articles published between 1847 and 1853, assumed the existence of a number of products of digestion intermediate between albumin and peptone, to which the terms parapeptone, metapeptone, dyspeptone, α , β , and γ peptone were applied. In 1869 Kühne received from Stokvis a specimen of urine which presented reactions similar to those observed by Bence Jones, and Kühne regarded the substances as identical. In the same year Gerhardt³ sought in the urine for other albuminous substances than serum albumin, and discovered a variety, called by him "latent," which resembled in its characteristics one of the peptones described by Meissner. He found it in a number of diseases, and observed that it was to be met with in persons whose temperature, frequently or constantly, was in the vicinity of 104° F. Senator⁴ later observed in the urine easily distinguishable quantities of what he regarded as peptone. He recognized that this substance might have been produced in albuminous urine by the process of boiling used in its isolation, but suggested that it may have been present in the freshly voided urine. In support of this view he referred to Gerhardt's discovery of a substance resembling peptone in urine in which no evidence of ordinary albumin was to be obtained. Leick,⁵ however, states that, although boiling may produce albumose from albumin, such a result does not necessarily follow, since numerous specimens of albuminous urine were so treated without the formation of albumose. Even in experiments on isolated albumin the quantity so transformed was too small to be significant. It was recognized also by Senator as possible for the albumin or albuminous urine, on its passage from the kidneys to the bladder and during its retention in this viscus, in part to be con-

¹ Philosoph. Trans. Royal Soc. London, 1848, Pt. i. p. 55.

² Herrman's Handb. d. Physiol., 1881, Band v. S. 94.

³ Deutsches Arch. f. klin. Med., 1869, Band v. S. 212.

⁴ Arch. f. path. Anat., etc., 1874, Band lx. S. 476.

⁵ Deutsche med. Wochenschr., 1896, Band xxii. S. 22.

verted into peptone, in accordance with the statement of Eichwald, that fluid albumin in contact with animal tissues at the temperature of the body is readily transformed into peptone. Eichwald found this substance in the urine of nephritis, and Obermüller, in 1873, in that of scarlet fever and Asiatic cholera. Gowers' a few years later noticed its presence in a patient who previously had suffered from glycosuria.

About this time Kühne gave the term hemialbumose to this substance, which was considered to correspond with the α -peptone of Meissner, and Schmidt-Mülheim² designated it propeptone. Its properties were studied also by Salkowski.³ All these observers recognized the resemblance between this so-called peptone, hemialbumose, or propeptone, and the substance discovered by Bence Jones. The methods employed for the recognition of the "peptone" were faulty, especially from the difficulty of wholly removing the albumin often associated, and from the frequent, if not constant, presence of "mucin," which also was precipitated by the alcohol used in isolating the substance, and which gave rise to reactions similar to those attributed to the peptone. Hofmeister⁴ consequently devised a method for the isolation of the so-called peptone which should free it from these sources of error. This method and the improvement subsequently made by Salkowski served as the basis of numerous contributions to the study of what has been designated "peptonuria."

The researches of Kühne and of Kühne and Chittenden⁵ led to the use of the term albumosuria as a substitute for propeptonuria. According to these investigators albumose, hemialbumose, or propeptone was a mixture of four albumoses which were designated protalbumose, deuteroalbumose, heteroalbumose, and dysalbumose. Each varied slightly from the others, especially with reference to the degree of solubility in water and in behavior toward solutions of sodium chloride, being either soluble or insoluble in dilute solutions and precipitated by concentrated solutions alone or in the presence of an acid according to the variety of albumose concerned. When in solution they were not precipitated by heat alone, but if precipitated by acids or salts were redissolved at a boiling temperature and were precipitated when the solution was cooled. According to Huppert, Mathes, and Rosin they become opaque at temperatures of 150°–152° F., and clot at 166°–178° F. They were precipitated by nitric acid and by acetic acid, by magnesium sulphate, concentrated solutions of sodium chloride, and of ammonium sulphate in an acid, alkaline, or neutral solution, and gave the biuret reaction.

¹ Lancet, 1878, vol. ii. p. 3.

² Arch. f. Physiol., 1880, S. 33.

³ Arch. f. path. Anat., 1880, Band lxxx. S. 552.

⁴ Ztschr. f. Physiol. Chem., 1880, Band iv. S. 253.

⁵ Ztschr. f. Biol., 1883, Band xix. S. 159, 219; 1884, Band xx. S. 11.

Like albumin, they were precipitated by nitric acid, ferrocyanide of potassium and acetic acid, sodium chloride and acetic acid, and ammonium sulphate, but they were not coagulated on boiling. They resembled peptones in being soluble at a boiling temperature, precipitating as the fluid became cool, and in giving the biuret reaction. They differed from peptone, according to Kühne,¹ in being precipitated by ammonium sulphate.

The search for albumose then became instituted, and the term albumosuria soon replaced that of propeptonuria, although for a long time it was considered to be a different condition from peptonuria.

The distinction made between albumoses and peptones, based upon the insolubility of the former in ammonium sulphate, was opposed by the observation of Neumeister² that this agent does not precipitate entirely all the albumoses, especially deuteroalbumose. Stadelmann in 1894 concluded that peptone as distinguished from albumose never occurred in fresh urine, although it might be found in stale albuminous urine from the action of bacteria upon the albumin. Von Noorden and Senator³ accepted this view, and maintained that both peptonuria and propeptonuria were albumosuria. According to Senator, if a part of the urine which gives a positive reaction to Salkowski's test, and, therefore, is considered to contain peptone, is slightly acidified and treated with ammonium sulphate in excess and filtered, there will be no biuret reaction in the filtrate, indicating the absence of Kühne's peptone, which should be soluble in the ammonium sulphate.

Albumose was found not only in the gastric contents during the digestion of albumin, but also in artificial peptone preparations and by Fleischer⁴ in normal bone-marrow. The discovery of its presence in semen is generally attributed to Posner,⁵ but this observer and others who have written upon the subject, with the exception of Kahler,⁶ have overlooked the fact that Bence Jones,⁷ the discoverer of albumose, found it not only in the urine and in pus, but also "in the secretion from the vesiculæ seminales." Virchow⁸ recognized in the bone-marrow of osteomalacia a substance which he considered to resemble that described by Bence Jones. Salkowski⁹ sought successfully for it in the liver and spleen of leukæmia and in the liver of acute yellow atrophy. Miura¹⁰ observed it in the liver, heart, and kidneys of phosphorus poisoning produced experimentally, and in the organs of a case of puerperal

¹ See article by Wenz: *Ztschr. f. Biol.*, 1886, Band xxii. S. 1.

² *Ztschr. f. Biol.*, 1888, Band xxiv. S. 267.

³ *Deutsche med. Wochenschrift*, 1895, Band xxi. S. 217.

⁴ *Arch. f. path. Anat., etc.*, 1880, Band lxxx. S. 482.

⁵ *Berlin. klin. Wochenschrift*, Band xxv. S. 417.

⁶ *Prag. med. Wochenschrift*, 1889, Band xiv. S. 33.

⁷ *Arch. f. path. Anat., etc.*, 1852, Band iv. S. 309.

⁸ *Loc. cit.*

⁹ *Loc. cit.*, 1880, Band lxxxi. S. 166; 1882, Band lxxxviii. S. 394.

¹⁰ *Loc. cit.*, 1885, Band ci. S. 316.

fever. Schultzen and Riess¹ previously had found albumose in the urine of phosphorus poisoning. Fischel² stated that albumosuria was present almost constantly during the involution of the puerperal uterus, and Kottnitz³ when there was a macerated foetus.

Albumosuria has been produced experimentally by Lassar⁴ by rubbing petroleum into the skin of animals. Plosz and Gyergai⁵ and Hofmeister⁶ caused it by the injection of peptone into the veins, and Jitta⁷ by the subcutaneous injection of glycerin. Rosenheim⁸ states that he has seen albumosuria follow the ingestion of large quantities of albumose in a case of severe intestinal disturbance.

The clinical importance of albumosuria has been made a matter of study by many observers whose results in the main agree. Although published under the titles of peptonuria, propeptonuria, or albumosuria, the method used for the purpose of determining the presence of the albumose was that of Hofmeister, or, in more recent years, by this method as modified by Salkowski.⁹ The chief advantages of the modification are gain in time and the use of a much smaller quantity of urine.

The urine to be tested must first be freed from any albumin present by acidifying from 30 to 50 c.c. with acetic acid, adding an equal quantity of saturated solution of common salt, boiling, and filtering. The albumins and albumoses are precipitated, but the latter are redissolved at the boiling temperature. The filtered fluid containing the albumose in solution is to be placed with a few drops of hydrochloric acid in a beaker, and then a solution of phosphotungstic acid is to be added while precipitation continues. The precipitate is to be consolidated by gentle heat into a coherent or powdery substance. The supernatant fluid is to be poured off, and the precipitate, washed with water, is to be dissolved in a solution of soda (specific gravity 1.16), which is to be added drop by drop until a blue or a colorless solution results. The solution, if blue, is to be decolorized by heat, and a few drops of a 1 per cent. solution of sulphate of copper are to be added to the soda solution, when a red or violet color, the biuret reaction, results if albumose is present.

Recently Salkowski¹⁰ has called attention to a possible source of error. He has found that urobilin, which is precipitated by phosphotungstic acid, gives also the biuret reaction, and that consequently a specimen

¹ Ann. d. Char-krankenh. zu Berlin, 1869, Band xv. S. 1.

² Arch. f. Gynäkol., 1884, Band xxiv. S. 400.

³ Deutsche med. Wochenschrift, 1888, Band xiv. S. 613.

⁴ Arch. f. path. Anat., etc., 1889, Band lxxvii. S. 157.

⁵ Arch. f. d. ges. Physiol., 1875, Band x. S. 53.

⁶ Zeitschr. f. physiol. Chem., Band v. S. 127.

⁷ Jahresb. u. d. Fortschr. d. Thier. Chem., 1885, Band xv. S. 474.

⁸ Allg. med. Centr., 1897, Band lxxvi. S. 1132.

⁹ Centralblatt f. d. med. Wissensch., 1894, Band xxii. S. 113.

¹⁰ Berlin. klin. Wochenschrift, 1897, Band xxxiv. S. 353.

of urine tested by the Salkowski method may give a positive result, but due to urobilin and not to albumose. Urobilin in the urine does not necessarily produce this reaction, but is more likely to in case the spectroscopic examination of the urine gives a well-marked urobilin line. Leick¹ already had suggested a modification of the Salkowski test, having found it necessary to use a stronger soda solution or a larger quantity of the weaker variety. After removing the albumin he added also the neutral lead acetate to the filtrate for the purpose of precipitating "mucin," coloring matter, and any remaining albumin. According to Salkowski, albumose also is precipitated by this reagent, and the negative results of the examination by this method could not exclude the possibility of albumosuria. Fortunately for practical purposes, the question relates to quantity and not to mere presence. Bang² also has devised a method for finding albumose in the urine, even in a dilution of 1:4-5000, when urobilin is present in any considerable quantity. A test-tube containing 8 grammes of finely powdered ammonium sulphate in 10 c.c. of urine is to be heated till the former is dissolved. The contents are to be boiled for a minute, centrifuged for another minute, and the clear liquid poured off. The residue, containing albumose, albumin, urobilin, uric acid, and urates, is to be stirred in alcohol (97 per cent.), which dissolves the urobilin and is to be poured off. This residue is boiled with a little water and filtered; the filtrate gives the biuret reaction if albumose is present. The centrifuge may be dispensed with, if the quantity of albumose is considerable, and the following method employed. After boiling some of the albumose adheres to the wall of the tube. The liquid is to be poured out and the adherent residue washed with alcohol to which a little chloroform is to be added if there is presumably much urobilin. The biuret test is to be applied to the filtrate from the residue dissolved in water. The presence of urobilin in the alcoholic extract is shown by a fluorescence when a few drops of a solution of zinc chloride are added. Hæmatoporphyrin may simulate albumose by causing a red color when the alkali of the biuret test is used. Its presence is to be suspected if the alcoholic extract is red and proven by the spectroscope. If, therefore, the alcoholic extract is red the urine should first be treated with barium chloride, which precipitates hæmatoporphyrin.

Maixner,³ von Jaksch,⁴ and Pacanowski⁵ examined hundreds of cases of various diseases by Hofmeister's method, and came practically to the same conclusion, that albumosuria was oftenest found in suppurative processes associated with the retention and disintegration of pus,

¹ Loc. cit.

² Deutsche med. Wochenschrift, 1898, Band xxiv. S. 17.

³ Vrtljschr. f. d. prakt. Heilk. Prag., 1879, Band cxliv. S. 75; Ztschr. f. klin. Med., 1884, Band viii. S. 234.

⁴ Zeitschr. f. klin. Med., 1883, Band vi. S. 413.

⁵ Ibid., 1885, Band ix. S. 429.

in acute infectious diseases, and in affections with more or less extensive destruction of tissues. Köppen¹ observed it in a number of insane persons, especially those who were maniacal or delirious. W. Robitschek,² Senator,³ and Leick,⁴ using Salkowki's method, arrived at a similar result. The albumosuria was relatively constant in deep-seated suppuration and in acute fibrinous pneumonia, especially during resolution.

Gerhardt's claim that ordinary or "latent" albuminuria occurred in persistent or frequent elevations of temperature above 104° F., and the statement of Krehl and Matthes⁵ that albumosuria was almost constant in fever, are subject to a different interpretation in the light of Salkowski's discovery concerning the reaction of urobilin.

Albumosuria has been found in various chronic affections, as well as in those of an acute nature. Among these chief importance is to be attached to the albumosuria of osteomalacia or of affections regarded as of this nature.

Such cases have been reported by Bence Jones,⁶ Kühne,⁷ Kahler,⁸ Stokvis and Ribbink, Matthes,⁹ Huppert,¹⁰ and Rosin.¹¹ According to Kahler, these are not examples of true osteomalacia, but of myelogenous tumors, sarcoma, lymphoma, myeloma, especially of the bones of the thorax. Matthes,¹² in four cases of osteomalacia which probably were of multiple myeloma, isolated from the urine a substance with the characteristics of albumose, but which, when digested for some time, gave rise to a ferrated nuclein. Hence the substance was regarded as a nucleo-albuminose arising from the ferrated nucleo-albumin of bone-marrow discovered by Nasse. It was not found in typical puerperal osteomalacia.

Raschkes,¹³ on the contrary, states that albumosuria occurs in senile osteomalacia, and Hammer¹⁴ and Marekwald¹⁵ make no mention of the importance of albumosuria in their analyses of the reported cases of multiple sarcoma or of allied affections of the bones.

In most of the diseases in which albumosuria has been found the albumose has been observed, as a rule, for a short time and in small quantity, although in rare instances for a long time and in large quantities. Pacanowski,¹⁶ indeed, subdivided the condition into acute and

¹ Arch. f. Psychiat., 1888-1889, Band xx. S. 825.

² Zeitschr. f. klin. Med., 1884, Band xxiv. S. 556.

³ Deutsche med. Wochenschrift, 1895, Band xxi. S. 217.

⁴ Deutsches Archiv f. klin. Med., 1895, Band liv. S. 501.

⁶ Loc. cit.

⁴ Loc. cit.

⁷ Loc. cit.

⁸ Prag. med. Wochenschrift, 1889, Band xiv. S. 35.

⁹ Verband. d. Cong. f. innere Med., 1896, Band xiv. S. 476.

¹⁰ Zeitschr. f. physiol. Chem., 1896-97, Band xxii. S. 500.

¹¹ Berlin. klin. Wochenschrift, 1897, Band xxxiv. S. 48.

¹² Loc. cit.

¹³ Prag. med. Wochenschrift, 1894, Band xix. S. 649.

¹⁴ Archiv f. path. Anat., etc., 1894, Band cxxxvii. S. 280.

¹⁵ Ibid., 1895, Band cxli. S. 128.

¹⁶ Loc. cit.

chronic albumosuria. But his distinction applied solely to the occurrence of the symptoms in acute and in chronic affections. A more practical division is into transitory and persistent albumosuria. Transitory albumosuria is to be found, despite the faulty methods and the opportunities of error, in such a variety of diseases as to have proven of but little practical value except in the diagnosis of acute pneumonia, deep-seated suppuration, including meningitis, and of macerated foetus. In all of these conditions the ordinary means of diagnosis are usually sufficient, and the leucocyte count affords a most satisfactory aid, and is an efficient substitute for the search for albumose.

Greater value is to be attached to the recognition of persistent albumosuria, the importance of which in practice has become especially suggested of late years in connection with the diagnosis of multiple but latent tumors of the trunk. Such an albumosuria is sometimes nearly a pure form, and is spoken of as primary or typical, better, perhaps, as persistent or excessive. This variety thus far has been observed principally in multiple bone tumors and in myxœdema, and in but few cases of these affections. These observations, however, are so suggestive as to demand general attention.

It has been my fortune in the past two years to have seen two cases of persistent and excessive albumosuria, so generally recognized as an exceedingly rare condition. The first case serves to introduce this communication; the second, now in charge of my colleague, Dr. F. C. Shattuck, to illustrate it. In the latter the presence of albumosuria, and its extreme degree, led to the probable diagnosis of multiple tumors of the bones, and the use of the Röntgen rays showed such changes in the structure of the bones as confirmed this opinion.

The source of the albumose in these cases may prove to be in the bone-marrow, as suspected by Virchow, but chemical analyses to determine this point have yet to be made. It is important also that the subcutaneous tissues in myxœdema should be examined chemically for albumose, since the nature of the infiltrating substance in this disease is still a matter of conjecture, and the presence of albumose in the urine of the two cases suggests a possibility requiring disproof, even if the search give no other information.

Whatever the value of albumosuria may be in diagnosis, its persistent and excessive presence is apparently a sign of grave prognosis, since the cases in which this condition has been found have, almost without exception, proven fatal.

INFECTIOUS MULTIPLE GANGRENE OF THE SKIN.¹

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THE recorded cases of multiple gangrene of the skin include two distinct varieties which differ considerably in their clinical features and are widely separated pathologically. Doutrelepont, Kaposi, Renaut, Bayet, Duhring, and others have reported cases under various names, occurring for the most part in nervous or hysterical women, which were, without doubt, trophoneurotic in nature. In these the cutaneous lesions were usually flaccid vesicles or bullæ, less frequently pustules, occurring in some instances in more or less well-defined groups, followed in a short time by gangrene of the skin, as a rule, superficial in extent, but in exceptional cases causing extensive losses of tissue. The course of the disease was commonly irregular, now better, now worse, lasting from a few months to several years. In a much smaller number of cases an infectious origin has been demonstrated by the finding of special micro-organisms in the lesions which culture and inoculation experiments proved to be pathogenic; or their infectious nature has been reasonably inferred from their symptoms and course.

The following case presents a somewhat unusual type of infectious gangrene of the skin, being characterized by some clinical and bacteriological features not noted in those hitherto reported:

Mrs. H. B., aged forty-six years, the wife of a farmer; pale and somewhat emaciated; was first seen in August of this year, through the courtesy of Dr. Zook, of Newville, Pa., under whose care she had been for three or four years. At the time of this first examination there were present upon the arms and legs six or eight perfectly round, deeply excavated, sharply circumscribed ulcers, and innumerable very white, mostly circular, smooth, slightly depressed scars varying in size from a pea to a silver dollar. Upon the right shoulder over the deltoid muscle was an especially large ulcer, two and one-half or three inches in diameter and extending down to the superficial fascia, the large size of this lesion being due to the fact that it had been allowed to pursue its course without treatment of any kind for three or four weeks. Some of these ulcers presented healthy granulating surfaces; others were covered with grayish or black moist sloughs.

Five weeks later the patient again came under observation in the wards of the Methodist Hospital of this city, to which she had come for the further study and treatment of her malady. Upon her admission to the hospital there were present a number of lesions in various stages of development or involution, a few upon the trunk, but the majority upon the arms and legs. Upon the upper part of the chest were four circular,

¹ Read before the College of Physicians of Philadelphia, January 5, 1898.

thick, black crusts, beneath which were shallow, granulating ulcers about an inch in diameter. About the centre of the flexor surface of the left forearm was a pea-sized, oval, black eschar, surrounded by an elevated vesicular ring an eighth of an inch wide, about which was a dark-red

FIG. 1.



Infectious multiple gangrene of skin. Vacciniform lesion on left forearm, about one week old. Numerous scars from old lesions.

inflammatory areola, the whole bearing a close resemblance to vaccinia just before the contents of the vesicle become purulent. This lesion was the seat of considerable pain, and was very firm and tender to the touch (Fig. 1). On the inner surface of the left thigh, about six inches below Poupart's ligament, there were three circular ulcers an inch or more in

FIG. 2.



Infectious multiple gangrene of skin. Ulcerating lesions on inner surface of left thigh.

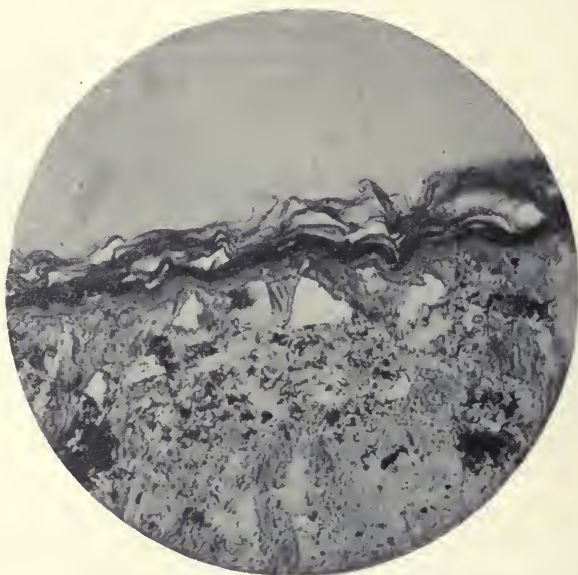
diameter, two of which were clean and granulating, while the third and largest was surrounded by an elevated border quite firm to the touch, on top of which was a flat, ill-defined, vesicular ring, the bottom being covered with a grayish, loosely adherent slough; this ulcer was also extremely painful (Fig. 2). Upon the left leg were several shallow

healthy ulcers which were rapidly healing; these had been the seat of gangrenous lesions which had been excised before the patient's admission to the hospital. As has already been mentioned, there were, in addition to these active lesions, numerous scars, the sites of former ones upon the chin, upper part of the chest, and upper and lower extremities. It is worth noting that the lower part of the chest, the abdomen, and the entire back were entirely free from evidences of disease past or present. The early history of the affection was briefly as follows: Four years ago the patient ran a meat-hook, which had been in use for some time, under the nail of the third finger of the right hand; shortly after this injury a painful spreading ulcer formed in this situation, which was followed by a second just above the right internal malleolus, the disease spreading thence to the parts of the body already noted. Since the appearance of the first ulcer the patient has never been free from the malady. Some two or three years ago an unusually virulent and destructive lesion appeared under the nail of the left thumb, for which the terminal phalanx of that member was amputated by her medical attendant, all other means taken to prevent the spread of the ulcer having been without avail. During her stay in the hospital new lesions made their appearance almost daily, at first upon the flexor surface of the forearms, later upon the inner surface of the right thigh. They began either as small, pale-red, slightly elevated papules which within a very few hours were replaced by pin-head-sized, flaccid vesicles capped by a small black crust, or they were vesicular from the beginning, with a minute black or brown crust upon the summit. They grew rapidly, attaining the size of a large pea within twenty-four hours; the central black eschar became depressed as it enlarged, and the whole lesion after two or three days resembled closely a vaccination vesicle six to eight days old. Unless excised or destroyed in some manner they continued to enlarge in all directions, the borders being very firm to the touch, while the centre was occupied by a constantly growing, dry gangrenous mass, which was in time loosened by suppuration occurring beneath it. It should be remarked here that this suppuration was evidently a secondary process, appearing only after the eschar had reached a considerable size. There was remarkable uniformity in the character of the lesions. As has already been mentioned, for the first few days they were vaccini-form in appearance; after the separation of the central eschar they became sharp-cut, round ulcers with elevated firm borders, spreading in depth and circumference, the bottom covered by a grayish or black slough. Although the disease was not attended by any constant general disturbance, the patient was subject to occasional attacks of severe chills followed by elevation of temperature—sometimes amounting to as much as 104° F.—and diarrhoea, these rarely lasting more than a day or two.

Microscopical examination of a number of excised lesions varying in age from twenty-four hours to five days showed that the disease involved the entire thickness of the skin. In the centre of the lesion the epidermis was transformed into a homogeneous, uniformly staining mass, which blended insensibly with the corium beneath; upon the sides it was lifted bodily from the papillary layer, forming cavities filled with small quantities of coagulated fibrin, degenerating epithelium, and cellular debris. The entire thickness of the corium was occupied by numerous hemorrhages and an enormous number of lymphoid cells, except in the

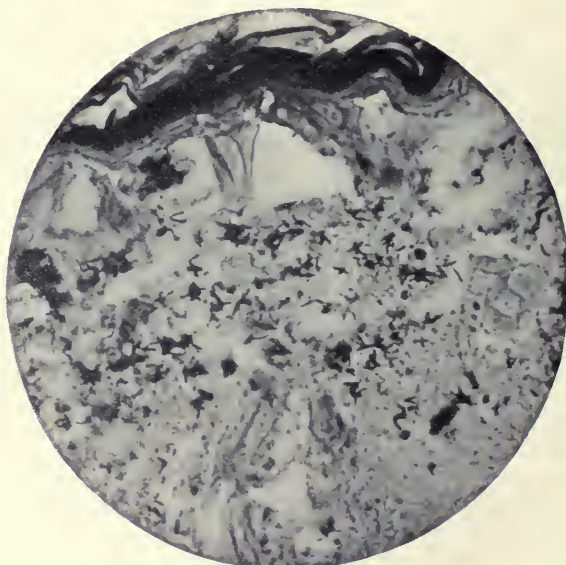
centre of the lesion, where it had been changed into a mass in which formed elements were no longer distinguishable; in the older lesions

FIG. 3.



Section of day-old lesion containing numerous bacilli.

FIG. 4.



Same as Fig. 3, high power.

the papillary layer was completely disintegrated. Far more interesting and significant, however, was the finding of great numbers of bacilli in the lowest layers of the rete and in the papillary and sub-papillary portions of the corium, where their growth had resulted in the almost complete destruction of the tissues. These micro-organisms occurred scattered about irregularly or in considerable masses, resembling morphologically the bacillus tuberculosis, staining best with gentian violet employed after the method of Weigert; all other methods and stains tried either failed completely to stain them or gave very inferior results. Beside this bacillus the ordinary staphylococcus pyogenes aureus was present in large numbers. (Figs. 3 and 4.)

The absence of any constitutional symptoms indicating a general infection, and the superficial situation of the bacilli in the early stages of the disease seemed to justify the assumption that the malady was a local one; the limitation of the eruptive lesions to those parts of the body easily accessible to the fingers of the patient suggested the probability that new lesions arose by autoinoculation. Acting upon these assumptions an effort was made to destroy the micro-organisms in the lesions by early intradermic injections of a 5 per cent. solution of potassium permanganate, this agent being chosen, not because it was regarded as the most effective bactericide, but because it could be introduced into the skin in sufficient quantities without danger of undesirable general effects from its absorption. In addition to these injections the skin was to be washed frequently with a 1 : 1000 solution of mercuric bichloride. Four lesions were injected with the permanganate solution a few hours after their appearance, with the effect of materially retarding their development, but the patient left the hospital too soon to determine whether they were completely aborted. Various forms of treatment had been tried before the case came under my care, but the only effective one had been excision. When the lesions were thoroughly excised, together with a considerable margin of sound skin, the wound thus made rapidly healed; if, however, all of the infected tissue was not removed, as happened frequently, the wound speedily became a steadily enlarging gangrenous ulcer with firm elevated borders, precisely like those which resulted from untreated lesions.

In most of the cases of infectious gangrene of the skin the disease commenced as an eruption of papules, vesicles, or pustules, usually small in number, which enlarging were transformed into eschars, beneath which circular, more or less deeply penetrating ulcers with a marked tendency to spread, occurred. The infectious variety is rarely so prolonged in its course as the trophoneurotic form, but that there are exceptions to this rule is proven by the case just reported. Severe constitutional symptoms, such as high temperature, delirium, extreme prostration, have occurred in a considerable proportion of the cases; in one case the disease terminated fatally.

Multiple gangrene may occur as a complication or sequel of some other acute infectious malady. Demme¹ has reported two cases of this character occurring in children who were the subjects of a severe attack of erythema nodosum, which was apparently contagious, since three children of one family were attacked by it at short intervals. The erythema was accompanied by chills, high temperature—40.2° C.—vomiting, and extreme pains in the legs and arms. One week after the beginning of the attack vesicles, which shortly became pustules, appeared upon the lesions of the erythema, and these in turn were transformed into gangrenous sloughs. A bacillus was found in the lesions, which when cultivated and inoculated into guinea pigs produced a gangrene of the skin like that observed in the children.

Three cases of gangrene of the skin complicating measles have been reported by Mensi.² In the gangrenous lesions were found the staphylococcus pyogenes aureus, a bacillus culturally and morphologically like the proteus vulgaris, and a bacterium resembling the diphtheria bacillus of Loeffler. Inoculation of guinea-pigs with bouillon cultures of the first two produced ulceration like that from which they were originally obtained.

Under the title "A New Species of Gangrene of the Skin with the Formation of Pustules," Rotter³ has reported a case of gangrene affecting a considerable area of the skin of the leg, which at the end of the second week was associated with an eruption of large hemorrhagic pustules, which continued to appear for fifteen months. From pus from the ulcerating surface and the pustules a bacillus was cultivated, which by reinoculation produced upon the patient lesions like the original ones.

Welsch⁴ has recently published a fatal case of cutaneous gangrene occurring in the person of a man who was addicted to the use of morphine hypodermatically, the initial lesion appearing at the site of an injection. From the lesions, which began as abscesses but later became gangrenous ulcers, a bacillus was cultivated which was markedly pathogenic. Simon⁵ has likewise reported a case of abscesses and gangrene occurring in a young woman, a victim of the morphine habit; when deprived of her syringe the disease disappeared, but returned when she got possession of it again. Although no micro-organisms were found in this case—probably because they were not looked for—the probabilities are greatly in favor of its being etiologically identical with the one reported by Welsch. As multiple cachectic gangrene, Eichhoff⁶ has published a case occurring in a child one and one-half years old, in which, two weeks after an attack of measles, an eruption of dark-red spots, blebs with cloudy contents, and deep ulcers with sharp-cut bor-

¹ Fortschritte der Medicin, 1888.

³ Dermatologische Zeitschrift, 1895.

⁵ Breslauer aerztliche Zeitschrift, 1879.

² Gazzetta Med. de Torino, 1894.

⁴ Archiv f. Dermatologie und Syphilis, Bd. xxxix.

⁶ Deutsche medicinische Wochenschrift, 1884.

ders, appeared. Many of the ulcers were covered with dry, black eschars. There was also a marked conjunctivitis with swelling of the lids and purulent secretion. Microscopical examination of material obtained from the bottom and edges of the ulcers revealed a quantity of fungus corresponding in size and appearance with the *trichophyton tonsurans*, the quantity of mycelium being remarkable. The conjunctivitis was also mycotic. Eichhoff believes that two cases presenting similar clinical features, which he had seen some time previously, and one of which he had reported as an example of cachectic gangrene, were due to the same cause.

In addition to the foregoing cases, in which the presence of a pathogenic micro-organism was positively demonstrated, there remains a small number in which the clinical features of the disease correspond so closely with those of proven infectious nature that they may reasonably be included in the same category, although no micro-organisms were found in them. Hallopeau and Le Damany¹ have described a case characterized by the development of red nodules in the centre of which a yellowish crust formed after loosening of the epidermis; beneath this crust ulcers with sharp-cut, perpendicular edges and covered with putrilaginous detritus appeared, which enlarged peripherally. Some of these lesions remained superficial and healed rapidly, others became covered with a dry black eschar, or becoming markedly indurated extended into the deeper parts of the skin. Along with these ulcerative lesions the lymphatic glands suppurated, giving rise to necrotic ulcerations. The buccal and guttural mucous membranes were affected as well as the skin. The authors reject the idea of a trophoneurosis in this case, but believe the malady to have been infectious, the lesions multiplying by autoinoculation.

Boeck² has published the details of a case of multiple gangrene in a child, ten months old, which began as red, slightly elevated spots upon the back, breast, scalp, and upper extremities, upon the summits of which vesicles quickly appeared. When these vesicles reached a certain size the centre became depressed and a brownish crust formed, the lesion at this stage resembling closely vaccine pustules nine or ten days old. The crust continued to enlarge until it included the whole lesion, not being simply dried epidermis, but formed by a more or less deep gangrene of the corium. Numerous micrococci were found, but, as these did not differ from those present in all inflammatory foci in the skin, no special significance was attached to them.

Janovsky and Mourek³ have quite recently published a case of cutaneous gangrene which began with an eruption of flat, pale-red, hard

¹ *Annales de Dermatol. et de Syphilis*, 1895.

² *Archiv f. Dermatol. u. Syphilis*, 1882.

³ *Archiv f. Dermatol. u. Syphilis*, Bd. xxxv. 1896.

and elastic papules surrounded by a red border. Some of these after enlarging disappeared, leaving the skin slightly pigmented and scaling; others became covered in the centre with a brown or blackish, lamellated, tightly adherent eschar, beneath which was an ulcer with slightly elevated border and steep sides. Repeated examinations of the secretions beneath the crusts and of the blood failed to reveal any micro-organisms. Notwithstanding the failure to find these, the authors do not reject the infectious origin of the malady, since disease of the blood-vessels, syphilis, or other constitutional disease was not present, and the most careful examination of the nervous system failed to discover any ground for belief in its trophoneurotic nature.

Lastly, I would include among the cases of infectious gangrene those of varicella gangrænosæ, of which a considerable number have been reported since Mr. Hutchinson first called attention to the malady.

THE CLINICAL SIGNIFICANCE OF REDUPLICATION OF THE HEART-SOUNDS.

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PERSONAL OBSERVATIONS. It is curious how all but the grosser physical phenomena escape a clinical observation which has not the habit of noting the apparently unessential as well as manifestly important occurrences. The present writer failed to notice reduplication of the heart-sounds in normal subjects until about four years ago, when, on theoretical grounds, it seemed that there should be perceptible doubling of the second sound of the heart, and, on looking for it, the phenomenon was observed. This sound-character was, for a while, casually noted as a physiological curiosity, but, ere long, observation seemed to show that its study might lead to results of importance to both the physiologist and the clinician. At all events, it appears that much of the confusion in the explanation of the physical signs arising from pathological conditions of the circulation is abolished by the views here presented. In this study it was soon found that attention could not be restricted to the comparatively simple phenomenon of reduplication of the second sound, for the much more difficult task frequently presented itself of explaining the reduplication of the first sound of the heart. Here, too, there seems reason to believe that the conclusions are not without importance. The present work, like all that has gone before it, too often suffers from the necessity of leaving, as final, theoretical explanations which are unfounded on physiological demonstration and which, from the nature of the phenomena, cannot be proved by post-

mortem findings. It is, nevertheless, an attempt to apply known facts of physiology to the solution of problems arising from the clinical study of the heart.

REDUPLICATION OF THE FIRST SOUND OF THE HEART. *Grades of reduplication.* Reduplication of either heart-sound may have every possible degree of completeness. The normal first sound of the heart may be graphically represented as a curve, like the familiar curve of muscular contraction, rising from a base line gradually to a maximum and then as gradually declining. The first approach toward reduplication is manifested in a prolongation of the period during which the curve maintains its maximum height. The next grade witnesses a slight depression in the highest part of the curve—that is, the first sound has two maxima separated by an interval of less intense sound. In a selected series of cases the notch in the sound-curve may be represented as cutting deeper and deeper until, in certain instances, the curve is completely divided, and we have the normal single first sound split into two sounds separated by an interval of silence. This latter phenomenon is comparatively rare, and probably is usually, if not always, the result of some morbid anatomical change, such as the existence of pericardial adhesions. But incomplete splitting of the first sound, particularly of the slight grade in which two maxima are barely noticed in it, is a common phenomenon. Potain, as quoted by Sansom, considers that doubling of the first sound can be detected in at least one-fifth of healthy subjects, whereas Sansom and some others think it a fact of great rarity. In 205 cases in which I have noted the presence or absence of reduplication, the first sound is recorded as being split or doubled in thirty-five cases. In only two or three of these subjects was the first sound completely divided by an interval of silence. It should be remarked that the lower pitch and longer duration of the first sound of the heart render the recognition of its reduplication much less easy than in the case of the second sound, whose maxima are separated by the same interval.

Difference between real and simulated reduplication of the first sound. It is a happy phrase by which Sansom characterized many cases of reduplication as due not to real repetitions of the normal sound-producing process, but to abnormal events which cause sounds *simulating* the normal cardiac sounds. In the subsequent consideration of the second sound of the heart no difficulty will be experienced in separating real from simulated reduplications. But difficulties arise in considering the first sound from the lack of certain physiological knowledge as to the causes of that sound. It will, for convenience, be here assumed that the first sound of the heart is purely muscular in origin, without in the least denying that, under normal conditions, the sound owes part of its intensity to vibration of the auriculo-ventricular valves or the

chordæ tendineæ. Under this dogmatic assumption, the reduplication of the first sound must mean that the muscular note has a double maximum with a more or less decided contraction pause between.

Real reduplication of the first sound due to non-synchronous contraction of the ventricles. Personal observation has about convinced me of the correctness of the views of Potain and of W. H. Broadbent, that reduplication of the first sound is due, usually, to lack of synchronism in the contractions of the ventricles. There are several reasons for this belief. In 1881 the present writer, in company with F. Donaldson,¹ showed that when the heart of a terrapin was laid bare and supplied with an artificial current of blood, that auricle which received the blood directly, and therefore endured the greater internal pressure, began its systole before its fellow. This but conformed with the well-known fact that intracardiac pressure, up to a certain degree, is a stimulant to the heart. It would be strange if the two ventricles, considering the varying ratios of pressure within them, would not occasionally manifest partial asynchronism. Physiologists are, moreover, familiar with the fact that in the dying heart excitability of the right ventricle lasts longer than that of the left.² Again, as pointed out by Broadbent, perception of the reduplication of the first sound is clearest when the stethoscope is applied to the chest over the line which probably corresponds with the position of the ventricular septum, and the double sound gradually becomes single to the right or left of this line, though the double character is usually maintained further in the former direction. The differential stethoscope is of considerable value in localizing the origin of the elements of the reduplicated sound. This instrument, as is well known, can readily be devised by removing the chest-piece from an ordinary flexible, binaural stethoscope and fitting to the ends of the rubber tubes thus set free two conical ear-specula. The apparatus is thus converted into two instruments, one connected with either ear. When one of the bells is placed somewhat to the left of the apex of the heart and the other near the left border of the sternum, the two elements of the double first sound may sometimes be heard nearly separately in the two ears, and the precedence in time of one element over the other can be distinguished. In one case of extreme valvular lesions, in which I was able to be sure of this time-relation, the sound from the left ventricle distinctly preceded that from the right. Some of my cases which were most laboriously studied, and which exhibited the most extraordinary reduplication of both sounds of the heart, are not available in this discussion, because no theoretical explanation of the phenomena could be made unassailable. In one such case the four heart-

¹ Sewall and Donaldson. On the Influence of Variation of Intra cardiac Pressure upon the Inhibitory Action of the Vagus Nerve. *Journal of Physiology*, 1880-82, vol. iii. p. 361.

² Bradford and Dean. *The Pulmonary Circulation*. *Journ. of Physl.*, 1894, vol. xvi. p. 76.

sounds were distinctly separate and similar in duration and quality; scattered through the prolonged systolic phase, they resembled the pattering of rain on a roof. Such extreme reduplication I have only noticed in extreme dilatation, with probable pericardial adhesion, with or without valvular incompetency. That reduplication of the first sound may occur in a marked form in an anatomically normal heart, I have had opportunity of proving by post-mortem examination.

A man, aged forty-seven years, seen at the end of the first week of a mild attack of typhoid fever, exhibited marked reduplication of the first sound nearly limited to the apex region. There was no evidence of nephritis or other complication. Ten days later, while apparently recovering, he suffered an intestinal perforation, for which an operation was performed. The patient died three days later from general peritonitis. The autopsy revealed but three intestinal ulcers, two of which were perforated (one of the perforations having probably occurred subsequent to the operation). The heart was practically normal, except for a slight thickening of one of the aortic valve segments, and very slight congestion of the upper surface of the tricuspid valve.

It is important to notice that in true reduplications of the first sound—that is, those presumably due to non-synchronous contraction of the ventricles—the two sound-elements are of the same “muscular” quality.

In a female patient, aged fifty-nine years, whom I have had under observation some four years, there was, when first seen, considerable hypertrophy of the left ventricle, with powerful murmurs indicative of mitral insufficiency, accompanied by some stenosis. The patient has fared comparatively well, and the murmurs have nearly completely disappeared; but compensation has been maintained not by any improvement in the mitral apparatus, but by an enormous hypertrophy of the left ventricle, whose sound, impulse, and area of dulness reach nearly to the region under the left scapula. Repeated examinations fail to show evidence of aortic regurgitation. My explanation of the great diminution of the mitral murmur is that the mitral valve has been thrown practically out of service through combined shortening of the *chordæ tendineæ* and dilatation of the auriculo-ventricular orifice, compensation being fairly maintained by accompanying hypertrophy of the left ventricle. The first sound at the apex, though much fainter than might be expected, has its normal quality, though it is presumably unmingled with a valvular element and is unconfused with the murmur. For a certain period, the first sound of the heart at the supposed apex in the ninth intercostal space back of the posterior axillary line was distinctly double, the murmur being hardly audible. It was made certain that the cardiac impulse against the chest-wall began with the second element of the double first sound. But three explanations of this fact present themselves: 1. The first element of the double first sound may have been due to sudden tension of the mitral curtains, as in the explanation of reduplication advanced by Sansom. But I have shown reason to believe that the mitral valve was incompetent to produce such a sound. 2. The two ventricles may have experienced non-synchronous contraction, the right preceding the left. 3. The left ventricle may have completed its contraction in two spasms, coming in con-

tact with the chest-wall only during the second phase. This explanation will be considered in the following section.

Reduplication of the first sound due to hypothetical double contraction of the ventricle. In physiological experiments upon the exposed heart, whether of the frog or mammal, it is often witnessed, particularly when the heart labors against abnormally high resistance, that the systole of the ventricles is completed not by a single wave of contraction, but by two distinct efforts, as if two contraction waves were superimposed one upon the other. Under normal conditions nothing of this can be detected with the unaided eye; but the evidence of physiological experiment is corroborative of the suspicion that the cardiac systole is readily broken up into two phases of energetic contraction separated by a phase of comparative rest. In a series of careful experiments, Rolleston¹ measured in dogs the endocardial pressure within the left ventricle. In certain cases, in which the resistance was suddenly raised by compression of the thoracic aorta, the tracings representing variation of endocardial pressure often show the normal wave, which should reach the *nil* point of pressure in diastole, to alternate with smaller, briefer double waves in which the diastolic pressure is far above the *nil* point. This same form of double wave with high diastolic intracardiac pressure is observed in tracings taken from hearts in which the aortic valves have been purposely broken through. The only obvious explanation of the fact is that the ventricle has completed its contraction in two spasms.

In a masterly series of experiments, Roy and Adami² proved that the normal mammalian ventricles at a certain period in their contractile movement submit to a pause for a small fraction of a second, as manifested by a slight nick or shoulder in the ascending limb of the contraction-curve. Their experiments, performed chiefly on dogs, were conducted in the following manner: through a window in the front wall of the chest the heart was exposed and the movements of the ventricular wall were graphically registered by a lever attached by a thread to a hook fastened in the ventricular wall. Simultaneous records were made of the contraction of the papillary muscles by means of a hook passed through the wall of the left auricle and caught in the middle of the edge of one of the mitral flaps. The graphic tracings showed that the systole of the ventricle begins before the contraction of the papillary muscles; the sealed slit of the mitral valve must, at that time, be pushed to a greater or lesser distance into the left auricle. The contraction of the papillary muscles then occurs³ and the mitral valve is

¹ H. D. Rolleston. Observations on the Endocardial Pressure-curve. *Journal of Physiology*, 1887, vol. viii. p. 235.

² Roy and Adami. Heart Beat and Pulse Wave. *Practitioner*, 1890, vols. xlv. and xlv

³ The discovery of Roy and Adami as to the relations of the activity of the muscle of the papillæ and of the cardiac wall offers a satisfactory explanation of a puzzling clinical phenomenon. It is often noticed, namely, that the murmur of mitral regurgitation does not attain

suddenly pulled down, greatly increasing the intra-ventricular pressure, of which the walls of the ventricle give evidence by a momentary cessation of movement. The authors also found that this sudden increase of intra-ventricular pressure gave the needed impulse for the opening of the sigmoid valves. Now, it seems not improbable that, under so-called pathological conditions, the duration of this pause in ventricular contraction should be so increased as to become directly perceptible to the senses. If this pause in the systolic movement of the ventricle reached a certain duration, it would be evidenced, clinically, by a doubling of the first sound of the heart. The above theoretical considerations are thrown out as a possible explanation of some cases of reduplication, but the matter will receive no further attention, for the reason that clinical verification of the hypothesis is wanting.

Some conditions determining true reduplications of the first sound. Like other observers, I have sometimes found splitting of the first sound to accompany change in the position of the body. In a case of slight relative insufficiency of the mitral valve and a rather weak heart, and in another showing partial incompetence of the aortic valve, changing from the recumbent to the erect position caused the single first sound to become obviously double. A somewhat similar phenomenon has been observed in practically normal subjects. A patient suffering from a mild attack of typhoid fever, whose heart was normal except for an unexplained dilatation of the right side, showed while lying on the back a normal single first sound, which, however, became double when he turned on the right side. In this case the reduplication occurred at the end of inspiration, instead of at the end of expiration, which, as stated by Potain, is the respiratory phase in which reduplication of the ventricular sound commonly occurs. The results of physiological experiment are very suggestive as throwing light on the relations of reduplication of the heart-beat to blood-pressure; but the clinician must beware of interpreting too fully the complex phenomena which he would analyze by conclusions drawn from relatively simple experiments, the conditions of which are under exact control. Martin¹ and his pupils at Baltimore proved that the dog's heart, physiologically isolated and supplied with an artificial current of blood, did not change its rate of beat under enormous variations of aortic resistance. Marey

its maximum intensity for a perceptible period after the beginning of ventricular systole. Indeed, in some cases, the murmur does not begin until the first sound has become well developed—that is, it is distinctly *post-systolic*. If we admit the fact that the papillary muscles do not begin their contraction until the contraction of the walls is well under way, we must also allow that at that period the murmur must reach its maximum intensity, because then the edges of the insufficient mitral valve are sharply pulled down against the regurgitating current, establishing the most favorable conditions for their vibration. As I recall cases in which the post-systolic character of the murmur was prominent, they seem to have been cases in which little sclerosis of the papillary muscles would have been suspected.

¹ Martin et al. Studies from the Biological Laboratory of Johns Hopkins University, 1878-84.

had previously shown that when the vagus nerves were intact every increase of arterial pressure was accompanied by a slowing in the rhythm of the beat due to reflex inhibition through the vagi. In the work with Donaldson previously quoted the writer found that, in the heart of the terrapin, increase of intracardiac pressure within what might be considered physiological limits had perceptible influence in diminishing the cardio-inhibitory action of the vagi. Now, if one but assumes that the two sides of the heart are independently innervated, it should follow that increase of arterial resistance in the aorta or pulmonary artery would cause reflex retardation of action in the left or right ventricle, respectively. On the contrary, increase of diastolic intracardiac blood-tension on either side of the heart might be expected to release that side of the heart from its presumed tonic inhibitory balance and hurry the commencement of its systole. The effect of respiratory movements upon the filling of the heart will be discussed in a later section. Though such speculations have their chief value as working hypotheses, clinical observation supports the view that intracardiac pressure is a controlling influence in regulating the rhythm of heart-action. In pulmonary emphysema, mitral stenosis, mitral and aortic regurgitation, the first sound is very apt to be double. These are conditions in which pulmonary blood-pressure and, at times, right-sided, diastolic intracardiac pressure are increased above the normal. I have also observed doubling of the first sound in several cases of aortic aneurism. It is interesting to note, preliminary to later discussion of the subject, that, in this splitting of the first sound at the septum near the apex, the second sound at the base of the heart usually becomes single as well as accentuated. When, however, ventricular reduplication is very decided, the second sounds at the base become widely separated, because each set of sigmoid valves closes in co-ordination with the relaxation of its own ventricles. In reduplication of the first sound caused by asynchronism in contraction of the ventricles, the first element of the sound seems, as a rule, to correspond with the systole of the right ventricle. In other cases, however, it has appeared as if the left-ventricle sound was heard first. It is extremely difficult to obtain certain evidence on this point.

In an important research by Roy and Adami,¹ on the failure of the heart from overstrain, these authors show experimentally that, at least in the dog's heart, physiological dilatation is readily brought about by increasing the resistance against which the heart empties itself. They assert the incorrectness of the ordinary physiological teaching, according to which the ventricles completely empty themselves at each sys-

¹ Roy and Adami. Remarks on Failure of the Heart from Overstrain. *British Medical Journal*, December 15, 1888, p. 1321.

tole, whatever the degree of arterial resistance. They show that, when aortic pressure in the dog is artificially raised much above the normal, a residuum of blood remains in the left ventricle at the end of systole. The amount of this residual blood may so increase as to produce a "physiological dilatation" of the ventricle and functional incompetence of the mitral valve. Such demonstrations suggest the great frequency with which, in structurally normal hearts, the conditions of intracardiac pressure may simulate those of organs suffering from permanent valve lesions. Such conditions also come into and complicate the study of sound-reduplications as influenced by intracardiac pressure. Roy and Adami also bring out the important fact, to which we will return later on, that with increase of arterial resistance the moment of opening of the semilunar valve is proportionately delayed. Thus, clinically, we have to consider the balance between the acceleration of contraction of either ventricle, and of the sound caused thereby, probably occasioned by the pressure in it of residual blood and the retardation of the second sound due to late opening of the corresponding sigmoid valve.

Significance of reduplication of the first sound in otherwise normal hearts. True reduplication of the first sound in healthy persons or when it readily appears in disorders not directly involving the heart is, in my experience, significant of circulatory incoördination of some kind, which is manifested by a tendency to fainting, dizziness, or precordial pain. So frequently has this association been observed that it is a common inquiry, when reduplication of the first sound without apparent cause is found, "Do you ever faint?" In a large proportion of cases the answer is affirmative.

Simulated reduplication of the first sound caused by late closure of the mitral valve. Such a condition ought possibly to be classed as a cause of *true* reduplication. In a previous section it has been stated that Hayden considers isolated, audible valve closure to be the normal cause of reduplication. According to Sansom's explanation, the *first* element of the double first sound is of valvular origin. I have recorded a single case in which the two elements of the double first sound of the heart seem to consist, respectively, of muscular and valvular components, the valve-sound forming the second element.

Reduplication of the first sound has been observed in this patient for more than two years. He is the victim of chronic pulmonary tuberculosis, with considerable cirrhosis of the left lung. He is subject to frequent fainting fits, supposed to be attacks of *petit mal*, and also of more serious seizures of the same kind. The area of cardiac dulness seems slightly enlarged though difficult to map out. Numerous careful examinations coincided in giving the following results. The first sound of the heart was frequently widely doubled throughout the cardiac

cycle, the second sound at the base being only slightly split at the end of inspiration. The reduplication of the first sound was most evident and loudest at the apex and a little to its right, being hardly noticeable at the base of the heart. The reduplication would gradually fail when the patient was at rest, breathing quietly. It immediately reappeared after a quick walk around the room or, if reclining, when a deep movement of either inspiration or expiration was made, and would often appear on rising from the recumbent to an erect position. The *quality* of the two elements of the first sound was strikingly different: the first element was muffled, low, and distinctly "muscular" in quality; the second was sharp, higher pitched, and "valvular." When the patient was in repose, and the first sound was single, this was accompanied by a soft systolic murmur loudest at the apex and slightly transmitted to the left (a very thick pleura no doubt interfered with the transmission).

When the first sound became double the murmur began with the first element of the double sound, and continued until the second (valvular) element was heard, when the murmur abruptly ceased. The apparent explanation of these results is as follows: For some unknown reason there was, under conditions of repose, functional incompetence of the mitral valve manifested by a systolic murmur accompanying the single first sound of the heart. But, through a little extra stimulation of the heart, the mitral flaps could be sharply brought together, though at a late period in the systole, and of course the regurgitant murmur would abruptly cease with that closure. Roy and Adami, in their work cited above, show that the mechanism of the papillary muscles is largely independent of the general muscular machinery of the heart, and it is worth suggesting that temporary murmurs, as well as isolated valve-sounds, may partly result from partial paralysis or functional weakness of the former structures.

I have several times noticed reduplication of the first sound, which seemed best explained by supposing that an audible valve-sound was produced by the "post-systolic" contraction of the papillary muscles; in these cases there was low arterial tension.

Simulated reduplication of the first sound produced by impact of the pulmonary artery against the chest-wall. Trustworthy observations are wanting to show the normal relations of the pulmonary artery to the chest-wall. Haycraft and Paterson,¹ from a study of frozen sections of dogs' chests, the heart having been killed in different phases of its cycle, conclude that the base of the heart recedes from the chest-wall during its systole. The fact, however, that the great arteries were

¹ Haycraft and Paterson. The Changes in Shape and in Position of the Heart during the Cardiac Cycle. *Journal of Physiology*, 1896, vol. xix. p. 496.

emptied previously to making the sections totally invalidates their conclusions, it being well known that the empty vessels pull the base of the heart upward and backward. W. Jenner¹ long ago showed that in human subjects, with shallow, flexible chests, cardiac murmurs could readily be generated by pressure with the stethoscope over the base of the heart. Constriction of the pulmonary artery was, no doubt correctly, ascribed as the cause of this phenomenon. With arteries full of blood, as in life, the basal rim of the heart must lie nearer to the chest-wall than is the case after death; also, with a distended left auricle the base of the heart is probably lifted forward. Roy and Adami² showed that in the dog's heart during the systole of the ventricles the anterior surface at the base comes closer to the chest-wall. When the chest of a mammal is opened and the beating heart is directly observed, the most extensive cardiac movement is one imparted by the two great basal arteries. When the ventricles shoot their contained blood into the already distended aorta and pulmonary artery, these vessels suddenly elongate under the increased strain, their lateral enlargement, as pointed out by Roy and Adami, being insignificant. It is admitted by all physiologists that the arteries in lengthening push down the base of the heart. The aorta springing nearly from the centre of the base and the pulmonary artery from its anterior circumference, the systolic push of the arteries would be expected to preponderate on the anterior segment of the base. As a matter of fact, this expectation is realized, for when the beating heart is directly observed the base has a nodding motion, as if its plane inclined forward and apexward at every systole. If the arteries are gradually emptied by bleeding the animal, the basal motion of the heart becomes proportionately less. The foregoing considerations make reasonable the supposition that, under certain conditions, the base of the pulmonary artery might at each systole of the heart strike against the front wall of the chest. Moreover, since the sigmoid valves are not open, and consequently the basal arteries do not elongate until a longer or shorter interval after the beginning of ventricular contraction, the sound of the blow upon the chest-wall should form the second element of the split first sound. The time interval elapsing between the beginning of ventricular contraction and the opening of the semilunar valves is said to be very variable. The extent to which the first sound is divided must vary in proportion. I have sometimes felt convinced, while making physical examinations of the chest, that apparent reduplication of the first sound was the result of impact of the pulmonary artery being superadded to the sound of ventricular contraction. The differential points in favor of this belief are: 1. The

¹ W. Jenner. *Medical Times and Gazette*, 1856.

² Roy and Adami. *Heart Beat and Pulse Wave*. *Practitioner*, 1890, vols. xlv. and xlv.

greatest intensity in the sound of the reduplication is found over the probable origin of the pulmonary artery. 2. In this area there is an impact, the chest-wall being moved outward, systolic in time. 3. The reduplication is usually plainest at the end of expiration (when the lung is least interposed between heart and chest-wall). 4. The second element in the split sound becomes louder with deeper pressure of the flexible stethoscope, which, as I have tried to show in another place,¹ indicates that the sound-producing body is in contact with the chest-wall. I am not yet prepared to state the clinical significance of simulated doubling of the first sound of this character.

Simulated reduplication of the first sound due to audibility of the auricular contraction. A typhoid fever patient, as a result of over-exertion early in convalescence, suddenly collapsed with symptoms of heart-failure. His heart, examined during the subsequent period of prostration, showed a marked increase toward the right in the area of precordial dulness. Fairly limited to the upper, right-hand corner of this area, under the third right costal cartilage and corresponding, probably, to the site of the right auricle, the sounds of the heart assumed a gallop rhythm.² This rhythm was composed of three elements, the third being the normal second heart-sound, the second the normal first heart-sound, and the first an abnormal sound immediately preceding the normal first sound. The impression given to the ear and the circumscription of the presystolic sound led to the suspicion that the first element of the triple sound was due to a labored and sonorous contraction of the auricle. After a few days the heart-sounds recovered their normal character. Few observers agree with Dr. Johnson³ in attributing ordinary reduplication of the first sound to audible auricular contraction.

THE SECOND SOUND OF THE HEART AND ITS REDUPLICATION.

Cause of the second sound of the heart. No one disputes the view that the second sound of the heart is due to vibrations originating in the pulmonic and aortic semilunar valves. Without going too minutely over familiar ground, it may be repeated that there is no doubt that the sudden tension of the sigmoid valves, which produces the second heart-sound, is also due to the reflux against the valves of the blood-wave which the ventricle in its systole has imparted to the arte-

¹ Sewall. *Clinical Uses of Stethoscopic Pressure in Examination of the Heart*. New York Medical Journal, 1897.

² The so-called "gallop rhythm" is usually described as composed of three sound elements occurring in the same cardiac cycle. It has sometimes seemed to me that the elements were four in number. The elements of reduplicated sounds are by no means necessarily separated by time intervals such as to give to the ear the impression of the gallop rhythm. The occurrence of this rhythm requires special study, and I have purposely avoided using in this discussion data derived from it. François-Franck, quoted by Sansom (p. 208), has made a valuable study of the *bruit de galop*.

³ George Johnson. *Lancet*, 1876, vol. i. 699.

rial system.¹ The time which elapses between the emptying of either ventricle and the stroke of the reflux wave upon its sigmoid valve must depend, at least, upon the following factors: 1. The length of time occupied by the ventricle in emptying itself, as determining the starting time of the positive arterial wave. 2. The arterial elasticity, as determining the rate of reaction of the arterial walls. Arterial elasticity may be said to depend (*a*) on the structure and thickness of the arterial wall; (*b*) on the amount of strain or tension to which it is submitted. The first element (*a*) is, in a given case, invariable; the second (*b*) is variable. 3. The length of the arterial tube through which the positive wave progresses; this may also, for practical purposes, be regarded as a fixed quantity, the reflux wave returning more quickly, other things remaining the same, the shorter the arterial path. Two variables are, therefore, to be considered as influencing the moment of sigmoid tension: first, the time taken for the positive wave to escape from the ventricle, and especially the moment of its beginning; second, the height of blood-pressure in the arteries. Notable difference in the times taken by the ventricles to expel their blood must, of course, be evidenced by a reduplication of the first sound of the heart. As to the action of the second variable, it is well to state that the rate of reaction of the arterial wall, and therefore the rapidity with which the reflux wave returns upon the sigmoid valve, increases with arterial blood-pressure, and the second sound succeeds the first sound of the heart at a shorter interval.

Reduplication of the second sound of the heart a normal phenomenon. From the considerations brought forward in the preceding section it is seen that the conditions determining the time of the closure of either set of semilunar valves are not without complexity. Though, according to various experimenters, the aortic as compared with pulmonary blood-pressure has a value of three or five to one, other factors may so hasten rebound of the pulmonary arteries as to make the closure of the pulmonic valve synchronous with or antedate that of the aorta. Physiological and clinical observation must, therefore, be the final resort in determining the relative movements of the two sets of sigmoid valves and the composition of the sound proceeding therefrom. From a great number of observations I venture to make the statement that reduplication of the second sound of the heart, so far from being unusual, is a normal phenomenon, and is to be detected in a large majority of healthy hearts. This reduplication has an infinite variety of degree, passing

¹ It seems very probable, as is suggested by a diagram constructed by Roy and Adami, that practical closure of the sigmoid valves occurs at a measurable interval before the reflux wave strikes them, and consequently before the second sound is generated. It is hardly in order here to discuss the reasons for this belief. It is, however, necessary to realize a fact admitted by all physiologists, that the sigmoid valves are firmly shut *before* the ventricles begin to relax in diastole.

from the short, sharp, single second sound through stages in which the second sound is obviously prolonged at the end of inspiration, or faintly exhibits two maxima at this respiratory phase, or, as is usually the case, shows a complete splitting or doubling of the second sound for one or two heart-beats. All observers agree that true reduplication of the second sound is most manifest at the end of inspiration. It is not unusual, in healthy subjects, to find the sound reduplicated throughout the respiratory cycle; the interval between the two elements of the sound is smallest at the end of expiration (when, it will be remembered, reduplication of the first sound, when it occurs, is commonly most obvious); then, as inspiration proceeds, the splitting of the sound becomes more and more obvious until, at the end of inspiration and beginning of expiration, the second sound is widely doubled with a perceptible interval of silence between the two elements. The widest reduplication of the second sound is, however, found in certain pathological conditions, particularly in cases of pericardial adhesions. In such cases I have not been able to observe the same relation between the phase of respiration and the length of the reduplication interval, which is so striking a feature in normal hearts. The degrees of reduplication can be well imitated by striking with the palmar side of two fingers against a wooden surface; every grade of doubling can be represented by letting the strokes of the fingers succeed one another at various intervals.

Time value of the reduplication interval. On the strength of authority which he does not specify, Sansom states that an interval of nine-one-hundredths to one-twentieth of a second may elapse between the closures of the two sets of sigmoid valves. He then asserts that these intervals are too small to be perceived by the ear. No less an investigator than Helmholtz¹ has asserted that at least one hundred and thirty-two separate pulses of air per second, in the form of "beats," can be distinguished apart by the ear. The physical characters of the arterial valve-sounds, their short duration and high pitch, especially fit them to be distinguished apart when separated by a very small interval. In this case probably a much smaller interval of reduplication can be perceived than in the first sound. I have made no effort to measure the duration of the reduplication interval, but it varies from *nil* to a period which seems to the ear to be at least as long as the sound element itself.

Physiological events determining reduplication of the second sound. It is, perhaps, the most commonly accepted opinion that the reduplication of the second sound has its origin in the non-synchronous closure of the two sets of arterial valves. But the fact that so competent an authority as Sansom totally disclaims the sigmoid origin of reduplication,

¹ Helmholtz. *Sensations of Tone*. Translated by Ellis.

is itself sufficient reason why nothing should be taken for granted in the explanation of the phenomenon. More than a year ago I submitted the question to the test of physiological experiment, resulting in the conviction that reduplication of the second sound is really due to the non-synchronous closure of the aortic and pulmonary valves. Following are abstracts from the notes of two experiments performed on dogs under morphia-ether narcosis:

EXPERIMENT I.—Large dog. Chest shaved. Carotid artery and vago-sympathetic nerve on left side isolated. A fine, stiff brass wire, coiled like a corkscrew at one extremity, was slipped through a slit into the carotid, and the screw end was passed down to the level of the aortic valve. The escape of blood from the artery was, of course, prevented by appropriate ligatures. With a turn or two of the wire the helix passed into the aortic orifice and the valve was prevented from closing. Some of the results were obtained by holding up one of the semilunar flaps by a wire terminating in a fine hook. In this dog the second sound is plainly heard at the left border of the sternum about two inches from the ensiform process. The second sound frequently seems double, especially at the end of inspiration. The first element of the reduplicated sound appears distinctly the louder. With the wire inserted between the segments of the aortic valve, the second sound of the heart is greatly reduced in intensity and becomes *single* (with the murmurs generated by this procedure we have nothing to do). It was subsequently found, post mortem, that the end of the wire had, at times, caught in the posterior wall of the ventricle. When the wire was caught in the heart-muscle in this way it was found to be sharply pulled apexward with each systole of the ventricle, and when it was gently strained in the opposite direction the first sound of the heart became distinctly double, but the second sound remained single, and was heard most plainly at the base of the heart. When the peripheral stump of the vagus nerve is stimulated by an interrupted electric current, the aortic valve being held open, the rate of heart-beat is much slowed, and the single second sound becomes nearly inaudible (because of the lowered blood-pressure in the pulmonary artery). Drawing the wire away from the valve, reduplication of the second sound reappears, again to become single when the valve is held open. When the aortic valve is pushed on from above, and consequently the intra-ventricular pressure is suddenly raised, the first sound of the heart becomes reduplicated at intervals.

EXPERIMENT II.—Large dog, treated as before, but a slit is also made in the abdominal wall so that two fingers can be inserted and compress the aorta. Without manipulation, the second sound is only prolonged, not distinctly split at the end of inspiration. When the aorta is compressed, the rate of heart-beat decreases probably one-half (reflex inhibition), and the second sound becomes double after a few seconds. Removing the compression, reduplication of the second sound persists for about a minute. Release of the aorta is also accompanied by reduplication of the first sound. Again applying pressure to the abdominal aorta, the first sound becomes single and the second double. With the left vagus cut, occlusion of the abdominal aorta causes both heart-sounds to become double, with somewhat of a gallop rhythm.

When the aortic valve is held open and the abdominal aorta is compressed, the second sound remains single, but becomes double when the valve is allowed to close.

These experiments show conclusively that reduplication of the second sound of the heart requires the co-operation of both sets of sigmoid valves. They also indicate that variation of arterial pressure may be an important factor in causing reduplication. Most important of all, there seems reason to conclude that in physiological experiment we have a means of solving many of the problems of cardiac pathology. An interesting clinical confirmation of the bivalvular origin of reduplication of the second sound is found in cases presenting an extreme grade of aortic regurgitation. In such cases the second sound at the base is invariably single, because the sound of aortic closure is absent.

Frequency of real reduplication of the second sound. Sansom¹ considers doubling of the second sound to be a phenomenon which is "extremely rare," and then goes on to enumerate various pathological conditions in which he has noted reduplication. These conditions are precisely those in which my own observations have shown the absence of true reduplication. The discrepancy finds an easy solution in the fact that Sansom uses the term "reduplication" to distinguish only *simulated* doubling of the second sound. As stated above, my observations are in accord with the opinion of those who hold that reduplication of the second sound is practically a normal physiological phenomenon. In one hundred and eighty-four cases, in which the condition of the second sound finds mention in my notes, the sound was reduplicated in eighty-five practically normal hearts, and in eighteen cases of heart-disease. The second sound was single or only prolonged at the end of inspiration in fifty-eight normal hearts and in twenty-three cases of heart-disease. The unity of the second sound in the eighty-one cases was, as will be hereafter explained, in most instances the result of some obstruction in the pulmonary circulation. It should also be mentioned that, when the second sound is reduplicated in disease of the heart involving pulmonary congestion, the first sound is almost sure to be coincidentally doubled. These points will be made clearer in a later section.

Area of audibility of real reduplication of the second sound. Sansom asserts that "the area of audibility of the phenomenon (reduplication of the second sound) is not marked at the base of the heart, while it is very manifest at the apex." This statement is misleading, since, as will be pointed out later, the reduplication referred to by this author is, to use his own term, *simulated* and due to wholly different causes from the sounds which originate in the sigmoid valves. I can only affirm that the phenomenon of true reduplication of the second sound

¹ Sansom. *Diagnosis of Diseases of the Heart and Thoracic Aorta*, 1892, p. 207.

is heard with greatest intensity at the base of the heart, usually under the second and third left costal cartilages bordering on the sternum. Sometimes the perception of reduplication is strictly confined to this area, but often it radiates with diminishing intensity in all directions, more especially downward.

Sansom discards the view that difference of arterial tension in the pulmonary and systemic circuits, respectively, can cause sensible reduplication, "for until the occurrence of diastole there can be no reflux, and consequently no second sound. The cause of the doubling, as of the first, so of the second sound, therefore, must revert to the ventricles. When their systole is perfectly simultaneous, the second sound, produced by the reflux against the semilunar valves of the two great vessels at the moment of ventricular relaxation, must be simultaneous; when the systole is not simultaneous, or does not last through equal periods of time, the diastolic reflux cannot be simultaneous. If the discrepancy be such as can be appreciated by the ear, the second sound is doubled." The author neglects the important fact, supported by the evidence of all physiological experiment, that closure of the semilunar valves, or the reflux against them, does not follow or coincide with the relaxation of their respective ventricles, but precedes it by a relatively considerable interval. It can hardly be imagined that the slight negative pressure sometimes created within the ventricle by its diastolic rebound can have any important effect in directing the inertia movements of the heavy blood-stream.

Sequence of the elements of the reduplicated second sound. It was stated above that it is, at times, apparently possible by the use of the differential stethoscope to find the order of precedence of the two elements of a double first sound when the bells of the instrument, connected with either ear, are placed one over the right, the other over the left ventricle. But, though it is easy to determine in a given case whether a sound is single or double, or even to be sure which of the two elements is the louder, it is extremely difficult, with the small time-intervals under consideration, to apprehend the order of precedence of two different sounds heard one by the right and the other by the left ear. I have made numerous observations to determine the order of sequence of the elements of the double second sound, and, to some extent, their areas of distribution. No conclusions were accepted except as controlled by observations made while the eyes were closed and the bells of the stethoscope were placed by an assistant upon the chest of the patient in positions unknown to the observer. The following extracts from clinical notes illustrate the points in question :

CASE I.—Patient, a male child, aged eleven years, with slight digestive disorder. At base of heart the second sound is widely double throughout inspiration. With one bell of the differential stethoscope

applied to the second intercostal space considerably to the left of the sternum, and the other bell to the corresponding space right of the sternum, the reduplication is heard, one element by each ear. The sound comes first to the ear from the bell applied to the right of the sternum.

The sound is cut off from either ear by clamping the corresponding rubber tube, or by firm pressure of the bell upon the chest (as explained in another place¹). That is, the sound of aortic closure is first in order, and is heard nearly pure in the second right interspace, while the sound of pulmonary closure is found isolated in the second space considerably left of the sternum.

CASE II.—Adult male, subject of extensive pulmonary tuberculosis. Second sound at base of heart is plainly double. In the second costal interspace, two and one-half inches left of mid sternum, the second sound is single (pure pulmonary). In the second interspace, two and one-half inches right of mid-sternum, the second sound is single (pure aortic). A bell of the differential stethoscope is placed on each of these two points, and the second sound appears double, the sound in one ear preceding that in the other. At the apex of the heart the second sound is single. With the bells of the differential stethoscope placed one on the apex and the other in the second interspace three and one-half inches left of mid-sternum, the second sound appears double. With the latter bell transferred to the second right interspace, the apex bell remaining in place, the second sound becomes single. That is, the second sound as heard at the apex is synchronous with that heard under the “aortic cartilage,” but precedes that heard in the second left interspace, which is probably due to pulmonary closure.

When both bells are applied to the second left interspace, one close to the sternum, where reduplication is obvious, and the other farther to the left, where the sound of pulmonary closure is alone heard, the *second* element of the double sound is louder. When the bell which is farther to the left is transferred to the pure aortic region right of the sternum, the *first* element of the double sound becomes louder—that is, in the first case the single sound of pulmonary closure has been added to the double sound of aortic-pulmonary closure, and the pulmonary element seems more intense. In the second case the reverse is true, the double sound containing the pulmonary element falls upon only one ear, while the aortic element strikes both ears, and, consequently, appears louder. The precedence of the two stronger sound-elements is reversed in the two cases, and we conclude that aortic closure precedes the pulmonary. I have ventured on this prolix description because it seems that the differential stethoscope is an instrument which should not be neglected in the study of heart-sounds.

Reduplication as influenced by the ratio of pulmonic to systemic arterial pressure. The normal variations of blood-pressure within the pulmonary artery and the conditions determining them are but little known. All authorities agree that the pulmonary and systemic circulations are largely independent of each other. The physiological mechanisms are so adjusted that the pressure within the systemic ves-

¹ Sewall. Clinical Uses of Stethoscopic Pressure in Examination of Heart. New York Medical Journal, 1897.

sels may undergo extraordinary alterations without noticeable influence on the pulmonic blood-tension.

Bradford and Dean,¹ experimenting on dogs, measured the pulmonary arterial pressure through a canula tied in the artery supplying the left lower lobe of the lung. Simultaneous records were made of pressure in the carotid artery. After vigorous artificial respiration the animal breathed, for some seconds, in a normal manner with the right lung. These authors say, "large oscillations of pressure in the systemic arteries produce often little or even no effect on the blood-pressure in the pulmonary artery. . . . The pressure in the lung vessels, however, undergoes a rise when the increase in the systemic pressure is not only considerable in amount, but also of long duration." The authors explain the former result by the great distensibility of the lung-vessels, which can accommodate a great excess of blood without strong elastic reaction of their walls. They also explain the negative influence on pulmonary blood-tension of enormous increase in aortic pressure (produced by compressing the thoracic aorta) as due to efficient working of the left ventricle and of the mitral valve. Bradford and Dean think they have demonstrated the action of vasomotor nerves on the calibre of the pulmonic vessels, though some observers have denied the existence of a pulmonary vasomotor mechanism. At all events, we are in the dark as to the normal relations of pulmonary arterial pressure to vasomotor influences.

Effect of position of the body on reduplication of the second sound. There are two conditions which are to be especially studied as influencing blood-pressure in the pulmonary artery: one is the position of the body and the other the respiratory movement. In a recent valuable communication, Hill and Barnard,² experimenting on dogs, came to several conclusions of great clinical importance. These authors fastened the animals under experiment on a table capable of being revolved in a vertical plane. Simultaneous tracings of blood-pressure were taken from the aorta and the superior *vena cava* through glass canulæ passed down the carotid artery and the external jugular vein, respectively. When a dog, narcotized with morphine, but otherwise normal, is placed in the feet-down position, the venous pressure at once falls and remains lowered until the horizontal position is recovered. The arterial pressure, however, is lowered only momentarily, rising to or somewhat above the normal during maintenance of the vertical posture. Hill and Barnard point out that the flow of blood into the heart is under control of the vasomotors of the abdominal vessels and the constricting effect upon

¹ Bradford and Dean. The Pulmonary Circulation. *Journal of Physiology*, 1894, vol. xvi. p. 76.

² Hill and Barnard. Influence of the Force of Gravity on the Circulation. *Journal of Physiology*, 1897, vol. xxi. p. 323.

the visceral veins exerted by the abdominal walls. They write, "The healthy heart cannot be thrown into paralytic dilatation by the most forcible compression of the abdominal veins. The chloroformed or asphyxiated heart, on the other hand, can easily be thrown into paralytic dilatation by this means. . . . The right heart can be emptied and a state of paralytic dilatation relieved by the simple procedure of dropping the animal into the vertical feet-down posture. This is a valuable method of recovery in conditions of asphyxia or chloroform collapse. . . . The *venæ cavæ* form a constant low head of pressure, from which the heart draws its supply. Thus the diastolic pressure within the heart is kept constant during the enormous changes of arterial pressure which are brought about by vaso-constriction."¹

In the few observations I have made as to the relation of the character of the second sound of the heart to position of the body, it has appeared that in the normal heart reduplication of the second sound was more marked in the erect than in the recumbent position, while with mitral regurgitation the reverse was the case. In the former condition pulmonary blood-pressure would be relatively reduced by the gravitation of blood from the right side of the heart, while in the latter pressure within the pulmonary system might be supposed to be increased by stronger relative backflow through the incompetent mitral valve, on account of heightened aortic resistance.

But, as might be inferred from the results of Hill and Barnard, conclusions as to the effect of posture on the ratio of pulmonary to systemic blood-pressure must always take into account the functional tone of the visceral bloodvessels and of the abdominal wall.

Effect of respiratory movements on reduplication of the second sound. All investigators admit that the respiratory movements are essential aids to circulation of blood through the lungs. As put by Rollett,² the diminution of intrathoracic pressure caused by enlargement of the chest in inspiration must reduce blood-pressure in the pulmonary veins, but has very little influence on the pressure within the thicker-walled pulmonary artery. Therefore, the rate of blood-flow into the left auricle is greatly accelerated. At the same time the great veins and right side of the heart are filled with blood by aspiration. This alone would greatly increase pulmonary arterial pressure were it not for the fact that, with the distention of the lungs by negative pressure outside them, the total capacity of the pulmonary vascular circuit is greatly increased in inspiration.

¹ It is reasonable to suppose that the upright posture of the body, found necessary by so many patients with heart disease, depends upon the relief so gained through gravitation of the blood from the overcharged right heart. It may be suspected that *posture* in heart disease has peculiar diagnostic value, for many who are desperately ill do not seem to require the upright position.

² Rollett. Hermann's Handbuch d. Physiologie, 1880, vol. iv. p. 280.

It is well known that tracings of systemic arterial pressure, usually taken from the carotid artery, show remarkable undulations of pressure dependent on the respiratory movements, though it would be an unwarranted assumption to suppose that other important physiological factors do not combine to cause the phenomenon. These respiratory undulations of systemic arterial pressure are not usually parallel in time with the respiratory movements; the waves commonly reach their highest point between the beginning and the middle of the expiratory phase, and the lowest between the beginning and middle of the inspiratory movement. The rise is apparently initiated by events dependent on inspiration, and the fall by conditions involved in expiration. These relations vary somewhat with the depth and frequency of respiration. According to the tracings obtained by Bradford and Dean, the respiratory waves in pulmonary arterial pressure are, in proportion to the total height of pressure, very much higher than the corresponding waves from the systemic arteries. Also, what is very important for this discussion, the respiratory waves in the two arterial systems do not correspond in their phases; that is, assuming the accuracy of their tracings, the highest pressure in the systemic arteries is not simultaneous with the highest in the pulmonary artery.

In an important work descriptive of experiments on dogs with divided vagi, S. de Jäger¹ dwells on the point that the change in the capacity of the pulmonary vessels, combined with the conditions of resistance to blood-flow therein, produced by respiratory movement, all are important in causing the "respiratory" variations in systemic arterial pressure. De Jäger's conclusions are best stated in his own words: "Every increase in the capacity of the pulmonary vessels causes a fall in the arterial (systemic) blood-pressure. Every decrease in the capacity of the pulmonary vessels causes a rise in arterial pressure. Every increase of resistance in the pulmonary vessels causes a fall in arterial blood-pressure. Every decrease of resistance in the pulmonary vessels causes a rise in the arterial blood-pressure.

	During normal respiration.	
	The capacity.	The resistance.
During inspiration becomes	Larger.	Less.
During expiration becomes	Smaller.	Greater."

We shall probably be right in concluding from the foregoing data that the maximum difference between the systemic and the pulmonary arterial pressures is reached just about the end of inspiration or beginning of expiration. For at this time the respiratory wave of blood-pressure in the aorta is reaching its highest point, while the maximum

¹ S. de Jäger. Experiments and Considerations on Hæmodynamics. *Journal of Physiology*, 1886, vol. vii. p. 130.

inspiratory capacity of the pulmonary vessels has been attained; but the elevation of pulmonary blood-pressure, due to collapse of the lung, has not yet begun. But this is just the time when, from the clinical side, the splitting of the second sound is, when heard, most obvious. It is not intended to deny that cardiac and vasomotor nerve action may have a share in the production of respiratory blood waves. Our conclusions would not thereby be essentially modified.

Alteration of the ratio of pulmonary to systemic arterial blood-pressure under pathological conditions. Increase of pulmonic blood-pressure probably accompanies every condition in which there is increased resistance to the flow of blood through the lungs. Thus, any defect of the mitral valve impedes the emptying of the lungs. In another way, pulmonary emphysema is probably the cause of impediment to the circulation in the lungs and elevation of blood-pressure. Anæmia of the lungs, on the other hand, no doubt results from inefficiency of the vasomotor mechanism of the abdominal vessels, or, in some cases, from laxness of the abdominal walls, allowing blood to settle in the great abdominal veins (Hill and Barnard). Physiological evidence is against the belief that the vasomotor mechanism of the lungs can compensate for any great diminution of blood in those organs, as the vasomotors of the systemic vessels can for the loss of fluid to the greater circulation.

The relation of the two sounds of the heart as to their reduplication. The full significance of the doubling of either sound of the heart cannot be apprehended until the condition of the other sound is determined. I will now assume, as proved, that reduplication of the second sound of the heart depends upon the non-synchronous closure of the two sets of semilunar valves, which is, in turn, dependent on the difference of tension in the pulmonary and systemic arteries as regulating the rate of recoil against their respective valves. When the pressure within the pulmonary system is relatively increased the reflux against the corresponding sigmoid valves is accelerated, and reduplication is lessened or fails. And if, as seems to be frequently the case, the right ventricle is stimulated, by increased resistance or the presence of residual blood within it, to begin its beat before the left, a prolonged or double first sound is heard, and the pulmonary semilunar closure is still more hastened. As a matter of fact, when the first sound has two maxima, or is slightly reduplicated, the second is usually single. Conversely, when the second sound is found to be single, the first is usually double; occasionally only careful search will disclose the double character of the first sound; but it is rarely missed when the more easily distinguished second sound is found to be single throughout the respiratory cycle.

In cases of typhoid fever I have a number of times found the second sound to be single during the first week or two of the disease, while at the same time the first sound was double. As the patient progressed

toward convalescence the second sound gradually became widely reduplicated and the first sound single. As will be seen later, the same clinical changes have been witnessed in pneumonia. If the contraction of the right ventricle precedes that of the left by a sufficient interval, the pulmonary valves will close before those of the aorta, and we shall hear both sounds reduplicated. In a case apparently suffering from pericardial adhesions, in which both sounds were double, the differential stethoscope seemed to show distinctly the sound of pulmonary closure to precede that of the aorta. As a matter of fact, it is always observed that when there is wide doubling of the first sound of the heart, which may be attributed to asynchronism in the ventricular contractions, there is also continuous reduplication of the second sound. Quite different in significance are those reduplications of the first sound caused by the left ventricle contracting before the right or by the right lagging behind the left. In such conditions the natural splitting of the second sound would be favored and the reduplication interval would be widened. Such is usually the case in chronic nephritis, though at times in this disorder a single second and double first sound may be found. In certain stages of nephritis, the first sound being single and the second but slightly split, the small reduplication interval of the second sound may be attributed to delayed opening of the aortic valves due to increased resistance. Curious results have been found in a case of nephritis with heart lesions, in which there were sudden variations in the rate of beat, and also in cases of valvular disease with intermittent beat; reduplication of either sound would come and go with different characters of heart action.

Pathological conditions in which reduplication of the second sound is marked. In cases of chronic nephritis, with high tension in the systemic arteries, reduplication of the second sound has, in my experience, usually been marked. In several cases of appendicitis it has been prominent. Subjects of pulmonary tuberculosis are, as a rule, favorable for observation of the phenomenon. This seems surprising when it is considered that resistance to blood flow in the lungs is probably increased, and that, at the same time, aortic pressure is diminished. But the anomaly is easily explained if we admit that there is also lowered vasomotor tone in the systemic vessels and stagnation of blood therein, thus restraining the return of blood to the right heart. In subjects of somewhat neurotic temperament, particularly females, some of the most striking examples of reduplication of the second sound have been observed.

Pathological conditions in which reduplication of the second sound is absent. The second sound is usually single, or but slightly prolonged at the end of inspiration, in cases of pulmonary congestion or in which resistance to pulmonary circulation is increased. Thus, the second sound is almost

invariably single in emphysematous subjects (a condition in which the first sound is usually prolonged or double). In a fatal case of emphysema with dilated right heart, the turgidity of the jugular veins and the distress of the patient were temporarily greatly relieved by hypodermatic injection of nitroglycerin; at the same time the second sound, which had been single, became reduplicated. In pneumonia, up to and through the acme of the disease, I have observed the second sound to be single, the reduplication reappearing and becoming more and more marked as convalescence proceeded. In cases of mitral regurgitation which are doing badly the second sound is single, though reduplication recurs to a slight extent when compensation and improvement take place. On the other hand, in regurgitation through the tricuspid valves reduplication of the second sound seems to be characteristic. The second sound is recorded as single in most of my cases of active pericarditis, aortic regurgitation, aortic aneurism, and pleural effusion. In numerous cases of hæmoptysis the second sound has been found single, reduplication returning after cessation of the hemorrhage. In a weak but normal heart reduplication of the second sound is often absent.

Simulated reduplication of the second sound of the heart. This is the form of reduplication which has received most attention and which, among most observers, has been confused with true doubling of the second sound. Sansom carefully distinguished between true and simulated reduplication of the second sound, and then decided that the latter condition was alone perceptible to the ear. The sound in question, which seems to be a repetition of the second sound of the heart, always follows the latter, and is separated from it by a shorter interval than removes the second from the first sound. It gives the ear the impression of a *rebound* from the second sound, and, though softer, often resembles it in quality and duration. The sound simulating doubling of the second sound is rarely heard at the base of the heart, but always at the apex or to the right of this point. The area in which it is heard is often strictly circumscribed, and may be limited either to the right or left ventricle, much more frequently the latter. The sound is annulled by gentle pressure with the flexible stethoscope.¹ At times the sound is more prolonged and has a rougher quality over the site of the mitral valve than at the apex. Sometimes, at least, it disappears with deep inspiration and becomes stronger with expiration. This sound is heard only in pathological conditions of the circulation in the heart. Close attention may detect it in a considerable proportion of cases. The simulated second sound attains especial prominence in the lesion of mitral stenosis, and is said to occur in at least one-third of such cases. I feel convinced, however, that the simulated reduplication of the second sound

¹ Sewall. Clinical Uses of Stethoscopic Pressure in Examination of the Heart. New York Medical Journal, 1897.

may, at times, be heard in any condition in which the blood-pressure in either auricle is much in excess of the normal. I have thus found it present in pneumonia, in nephritis complicated with pericarditis, and in mitral regurgitation without evidence of stenosis. Sansom also enumerates several disorders in which he has observed the sound. That view is probably correct which regards the simulated reduplicated second sound as having its origin in the elastic reaction of the overstrained (usually left) auricle which comes into play at the moment the resistance in front is lowered by the diastolic dilatation of the ventricle. The sound is thought by Sansom to be made by the sudden tension imparted to the mitral valve by reflux of the current issuing from the overstrained auricle at the beginning of diastole. Roy and Adami suggest that, in mitral stenosis, the sound is due to the vibration of the free edge of the narrowed orifice caused by the direct passage of the current from the auricle. I have heard the sound under conditions in which there seemed reason to believe that the mitral valve was practically inoperative, and have ascribed it to the sound of impact of the blood against the ventricular wall. This, I understand, is essentially the explanation for the phenomenon given by Potain. It may be observed that in mitral stenosis, in which condition this phenomenon is most common, the aspirating force of the ventricle, greatest at the beginning of diastole, probably produces a greater negativity of pressure within the ventricle than in any other condition. The verification of these theories must await more evidence from the combination of clinical with post-mortem, not to say physiological, observation.

Diagnostic value of the study of reduplication. In the cases in which I have observed simulated reduplication of the second sound I have always made sure that this was not the real reduplication caused by non-synchronous closure of the semilunar valves. This has always been possible by finding in the second or third left interspace the characteristic prolongation or splitting of the second sound at the end of inspiration. No diagnosis of "simulation" in the doubling of the second sound can be certain until the normal splitting of the second sound is recognized as occurring independently. Thus the recognition of the character of the true second sound of the heart greatly facilitates the analysis of the complex signs which strike the ear under pathological conditions. Again, estimation of the reduplication interval in the second sound is of great assistance in the judgment of the tension of the pulmonary bloodvessels. It is well known that, in pneumonia, for example, considerable aid is given the clinician by the comparison of the loudness of the second sound as heard at the base of the heart and under the aortic cartilage, the relative intensity in the former position increasing in some proportion with tension in the pulmonary artery. But the loudness of the pulmonary element of the second sound is greatly modified by con-

ditions not directly affecting arterial tension, such as the conducting power of the interposed lung and proximity of the artery to the chest-wall. The presence or absence of reduplication, supposing the first sound to be single, is determined by arterial tension alone. In conclusion, there seems reason to believe that we have in the study of the second sound of the heart an opportunity of estimating, as can be done in no other way, the tension of the blood in the pulmonary artery, and hence the activity of the circulation in the lungs and the completeness with which the vital process of oxidation is carried on. In this estimate must be included as factors the consideration of other variables, namely, the height of systemic arterial blood-pressure, as judged from the tension of the radial pulse; the condition of the vasomotor system, especially of the splanchnic area; the tone of the skeletal muscles, particularly those of the abdominal wall; and, finally, the condition of the ventricles of the heart as regards the efficiency of their contraction, and the presence or absence of the signs of asynchronism in the action of the two sides.

SUMMARY AND CONCLUSIONS. Reduplication of the first sound of the heart is a frequent phenomenon, especially in pathological conditions. It may have every degree of completeness from mere prolongation of the first sound to distinct doubling of the same. The condition is most marked at the end of expiration.

Reduplications of the first sound may have various causes, but may be grouped under two heads, as *real* or *simulated*. Under the first division fall those reduplications of the first sound due to asynchronism in the contraction of the ventricles.

There is also reason for the suspicion that reduplication may have its origin in a double systolic effort of the ventricles.

Simulated reduplication of the first sound is probably frequently caused by undue lack of synchronism between the contraction of the ventricle and the tension-sound of the corresponding auriculo-ventricular valve. Simulated reduplication may arise from a post-systolic blow of the pulmonary artery against the chest-wall.

Simulated reduplication of the first sound may be due to audibility of the auricular contraction. No doubt other physiological or adventitious conditions may cause apparent doubling of the first sound.

The prominent factor in causing real reduplication of the first sound is intra- and extra-ventricular blood-pressure. As a rule, that ventricle contracts first within which the diastolic blood-pressure is relatively increased.

When reduplication of the first sound is perceived in normal subjects, it often indicates a lack of cardiac co-ordination, which provokes special symptoms referable to the circulation.

True reduplication of the second sound of the heart is produced by asynchronous tension of the two sets of sigmoid valves.

The phenomenon is a normal one, the aortic valve tension preceding the pulmonary at the end of inspiration and beginning of expiration.

The splitting of the second sound may be wholly absent or only perceptible at about the end of inspiration, or reduplication may be represented by a double sound throughout the respiratory cycle.

The widest reduplication of the second sound occurs when the ventricles are asynchronous in action. When the right ventricle slightly precedes the left the second sound is single, and, conversely, when the second sound is single the contraction of the ventricles is usually asynchronous.

When the first sound is single the character of the second sound as regards reduplication depends upon the ratio of pulmonic to systemic arterial blood-pressure. The greater the difference between these pressures the more marked the reduplication, and *vice versa*. Therefore, when the lung vessels are congested or resistance to outflow from them is increased, reduplication of the second sound is diminished or absent. At the beginning of fevers a single second accompanied by a double first sound has been found; the reverse condition follows as convalescence is reached.

True reduplication of the second sound is heard most plainly at the base of the heart under the second and third left costal cartilages bordering upon the sternum.

Position of the body and especially respiratory movement influence reduplication of the second sound, in so far as they influence the ratio of pulmonic to systemic arterial pressure.

There is reason to believe that the maximum difference between aortic and pulmonary arterial pressures is rhythmically reached at the end of inspiration and the beginning of expiration—that is, in the phase of respiration in which the splitting of the second sound is most marked.

We are probably now in possession of sufficient physiological data to make the estimate of the conditions involving reduplication of the heart-sounds of considerable clinical value.

A CASE OF TUBERCULOSIS OF THE BREAST,

WITH AN ANALYSIS OF ALL CASES OF TUBERCULOSIS OF THE BREAST
RECORDED IN MEDICAL LITERATURE.

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AMONG the fifty cases of tumor of the breast which came to my clinic at the Massachusetts General Hospital, Surgical Out-patient Department, during the last service, there appeared :

Mrs. Y., an Italian, aged forty-three years. She has had seven children. The eldest child is twenty-five, the youngest child is three years. She has always had fairly good health, and remembers no personal illness. Five years ago there was a painful swelling in the left breast, which was opened about one year later. Three years ago, when nursing her last child, there was a return of pain, and a swelling appeared, which was opened. She complains now of pain and persistently discharging sinuses in the breast. Her chief complaint is constant pain.

The physical examination finds a mitral murmur at the apex of the heart. The left breast presents several cicatrices about the edge of the areola, in which cicatrices are seen the openings of sinuses discharging a dirty-white material. No milk comes from the breast. There is felt a small, tender, fluctuating area the size of a large bean near the areola, and there are also areas of induration about the sinuses. The remainder of the breast-tissue feels normal. One or two axillary glands are felt upon this side.

A diagnosis of tuberculosis of the breast was made from the clinical picture, and she was referred to the hospital, where Dr. John Homans, into whose service she went, operated, removing the portion of the breast involved.

The following is the microscopical report of the Pathologist to the hospital:

PATHOLOGICAL LABORATORY,
MASSACHUSETTS GENERAL HOSPITAL, BOSTON, MASS.

Areas made up of epithelial cells, with here and there giant-cells, and marked infiltration with polynuclear leucocytes. The areas are seen in process of breaking down. Tuberculosis.

J. H. WRIGHT, M.D.

There is no organ or tissue in the body which is free from the ravages of tubercular disease. Even the mammary gland is occasionally the seat of tuberculosis.

Anatomical and bacteriological evidence must determine whether any case under consideration is one of tuberculosis or not.

It is upon this basis that the cases reported have been judged and have been accepted or rejected as tubercular.

The microscopical evidences of tuberculosis are the finding of either the tubercle bacilli or the anatomical tubercle, or both together, in the diseased tissues or in the discharges from these tissues through a fistulous opening or through the nipple. To determine that a given case is one of primary or secondary infection, through either metastasis or contiguity of tissue, is far more difficult and in many instances is well-nigh impossible, without a complete autopsy.

Many cases of chronic mastitis, chronic abscess of the breast, mammary fistulae, and scrofulous tumor, so-called, are the results of tubercular infection. Cases have been reported which clinically were tubercular, but in the absence of positive evidence they have been rejected.

A very careful search of medical literature finds, including the case

above reported, but 80 instances recorded as tuberculosis of the breast. Twenty-three of the 80 cases are lacking in positive anatomical and bacteriological evidence and are not to be regarded strictly as tubercular.

Four of the 80 cases are *distinctly secondary, viz.:*

- Case 9 (Mandry) was secondary to ostitis of the rib.
- Case 12 (Mandry) was secondary to axillary glandular enlargement.
- Case 18 (Müller) was secondary to axillary glandular enlargement.
- Case 25 (Gaudier and Peraire) was secondary to caries of the sternum.

These four and the remaining fifty-three cases are the only reported instances of tuberculosis of the breast in medical literature.

A list of these cases and the surgeons reporting them, together with the references to literature, are here given.

Fifty-three Cases of Tuberculosis of the Breast.

- Case 1. Rémy et Noel. *Bulletin de la Soc. anatomique*, June 1893, p. 412.
- Case 2. Walther et Pilliet. *Bull. de la Soc. anatomique*, April, 1895, p. 312.
- Case 3. Powers. *Annals of Surgery*, 1894, p. 159.
- Case 4. Powers. *Annals of Surgery*, 1897, p. 86.
- Case 5. Villar. *Gazette des Hôpitaux*, 1894, p. 606.
- Case 6. Le Dentu. *Revue de Chirurgie*, 1881, tome i, p. 27.
- Case 7. Lotheissen. *Wiener klinische Wochenschrift*, 1897, No. 34, p. 763.
- Case 8. Mandry (Habermaas). *Beiträge zur klinischen Chirurgie*, 1891-2, vol. viii, p. 179.
- Cases 10, 11, 13, and 14. Mandry. *Ibid.*
- Case 20. Poirier. *Thèse de Paris*, 1883.
- Case 21. Hebb. *Trans. Patholog. Soc.*, vol. xlv, p. 123. London.
- Case 22. Schede. *Deutsche medicinische Wochenschrift*, 1893, p. 1316.
- Case 24. Reerink. *Beiträge zur klinischen Chirurgie*, 1895, vol. xiii, p. 49.
- Case 27. Gaudier and Peraire. 1st and 3d Case. *Ibid.*
- Case 28. Sabrazes and Binaud. *Archives de Médecine experim.*, 1894, No. 6, p. 833.
- Case 29. Demme. Schmidt quotes from 26th Bericht über die Thätigkeit des Jennerschen Spitals. Bern, 1889.
- Case 30. Ugo Pisani. *Policlinico*, 1896, vol. iii, No. 23, p. 594.
- Cases 33 and 35, Bender, 1st and 3d. *Beiträge zur kl. Chirurgie*, 1891-2, vol. viii, S. 205.
- Case 36. Habermaas. *Beiträge zur kl. Chirurgie*, 1886, Bd. ii. (quoted by Bartels).
- Case 39. Johannet. *Revue Médico-chirurgicale*, tome xiii., 1853.
- Case 42. Richet. *Gazette des Hôpitaux*, No. 55.
- Case 43. Duret. *Le Progrès Médical*. Paris, 1882, No. 9.
- Case 47. Dubar. *Des Tubercules de la mamelle. Thèse*. Paris, 1881.
- Cases 48 and 49. Ohnacker. *Archiv für klin. Chirurg.*, Bd. 28.
- Cases 50 and 51. Orthman. *Virch. Archiv*, Bd. 100.
- Case 52. Kramer. *Centrab. für Chirurg.*, vol. xv, Zeit, p. 867.
- Cases 53 and 54. Piskacek, 1st and 2d. *Med. Jahrbücher*. Wien, 1887, S. A.
- Case 59. Piskacek, 7th. *Wien. med. Jahrbücher*, 1887, Bd. 10.
- Cases 62 and 65. Berchtold. *Ueber Mammatuberkulose*, 1880. Uster, quoted by Mandry.
- Case 66. Berchtold. *Ueber Mammatuberkulose*, 1890. Uster.
- Case 68. Hering. *Inaugural Dissertat. Erlangen*, 1889. Mandry.
- Cases 69 and 70. Roux. *De la Tuberculose Mammaire*. Genève, 1891.
- Cases 71 and 72. Dubreuil. *Gazette Médicale*, April 28, 1888.

- Case 73. Shattock. *Trans. Path. Society*. London, 1889, vol. xl. p. 391.
 Case 74. Souplet. *Bulletin Société Anatomique*. Paris, 1886.
 Cases 75 and 76. Reverdin. Quoted by Bartels, without reference.
 Case 78. Bartels. *Inaug. Dissert.* Marburg, 1892.
 Case 79. Ely. *Proceedings of New York Path. Soc.*, 1891, p. 81. (Quoted by Powers.)
 Case 80. Scudder. Writer's case here reported.
 Case 81. Dubar. *Des Tubercules de la mamelle*. Thèse. Paris, 1881.
 Case 82. Davis. *Medical News*, Philadelphia, June 12, 1897.
 Case 83. Davis. *Ibid.*

The references to the four cases of evident secondary tuberculosis of the breast are:

- Case 9. Mandry (Habermaas). *Beiträge zur klinischen Chirurgie*, 1891-2, vol. viii. p. 179.
 Case 12. Mandry. *Ibid.*
 Case 18. Müller, Ludwig. *Inaugural Dissertation*. Würzburg, 1893.
 Case 25. Gaudier et Peraire. *Revue de Chirurgie*, 1895, vol. xv. p. 768. A fourth case.

There were 23 cases reported as tuberculosis of the breast which were rejected because of insufficient proof. A list of these rejected cases follows:

- Cases 15 and 16. Billroth. *Deutsche Chirurgie*, Billroth u. Lücke, published 1880. (Quoted by Le Dentu, *Rev. de Chir.*, 1881, p. 27.)
 Case 17. Park. *Medical News*, vol. lxix. 1896, p. 524.
 Case 19. Horteloup. *Tumeurs du Sein chez l'homme*. Paris, 1892. (Quoted by Poirier, Thèse de Paris, 1883.)
 Case 23. Schede. *Deutsche medicinische Wochenschrift*, 1893, p. 1316.
 Case 31. Lane. *British Medical Journal*, 1890, vol. ii. p. 630.
 Case 32. Lane. *Transactions of Clinical Soc.*, 1892, vol. xxv. p. 243.
 Case 34. Bender. *Beiträge zur kl. Chirurgie*, 1891-92, vol. viii. S. 205.
 Cases 37 and 38. Velpeau. *Maladies du Sein*, 1854, cited by Bartels.
 Case 40. Heyfelder. *Deutsche Klinik*, 1851, No. 48.
 Case 41. Richet. *Gazette des Hôpitaux*, No. 55.
 Case 44. Duret by Lotheissen. *Le Progrès Médical*. Paris, 1882, No. 9.
 Case 45. Duret, same with Case 43. *Le Progrès Médical*. Paris, 1882, No. 9.
 Case 46. Duret, same with Case 44. *Le Progrès Médical*. Paris, 1882, No. 9.
 Case 55. Piscacek. *Wien. med. Jahrbücher*, 1887, Bd. 10.
 Cases 56, 57, 58, and 60. Piscacek. *Wien. med. Jahrbücher*, 1887, Bd. 10.
 Cases 61, 63, 64. Berchtold. *Ueber Mammatuberkulose*, 1890. Uster, Bartels.
 Case 67. Hebb. *Trans. of Patholog. Society*, 1888. London.
 Case 77. Kummer, quoted by Bartels. *Inaug. Diss.* Marburg, 1892. No reference given.

It is necessary to make brief mention of the 23 rejected cases. In the sputum of several cases of Piscacek, namely, Cases 55, 56, and 58, tubercle bacilli were found. The individuals had tuberculosis of the lungs and presented, clinically, tubercular lesions in the breast. It would be highly improbable that in manifestly tubercular subjects, in whose sputa tubercle bacilli were found, lesions in the mammary gland clinically resembling those of tuberculosis should be any other than tubercular.

Billroth, two cases: one, Case 15, presented multiple cheesy nodules which healed after incision and cauterization; the second, Case 16, presenting nodules in the breast, some of which contained cheesy material, died of tuberculosis.

Horteloup's case (19) presented a flattened tumor about the nipple, with tuberculosis of the lungs and of the epididymis.

Schede's second case (23) was a pathological specimen, incompletely recorded; no history was reported.

Of Lane's two cases, one (Case 31) showed abscesses in the breast and caseous lymphatic glands; the other (Case 32), in a phthisical subject, presented a breast abscess.

Bender's case (34), in a phthisical subject, showed both breasts involved with a hard tumor fluctuating in one spot and with enlarged axillary glands.

Velpeau's two cases (37 and 38) presented hard, lumpy feeling masses, one fluctuating, the other having fistulæ.

Heyfelder's case (40) was that of a large abscess near and overlapping the region of the breast, acute in its course.

Richet's case (41), in a phthisical subject, was a cold abscess in the breast with enlarged axillary glands.

Duret's case (44), reported by Lotheisen, is probably the same as Case 46, in which there was an axillary swelling the size of a small apple, tender and movable, together with cheesy glands.

Duret's case (45) is the duplicate of Case 43, which is accepted.

Piskacek's case (55) is a phthisical subject in whose sputum tubercle bacilli were found. The left breast was atrophic, very little glandular tissue was present. There were scars in the skin of old fistulæ, and there were existing fistulæ. There was an ulcer near the nipple, with violet-colored edges. Clinically, this would seem to be a very satisfactory case.

Piskacek's case (57) exhibited fistulæ following a mastitis, and Case 60 exhibited a hard swelling of the right breast, softening in places, an ulcer of the skin and fistulæ.

Berchtold's case (61) was an individual presenting glands in the neck and multiple hard nodes in the breast, which had softened, discharged, and healed.

Berchtold's case (63) was a girl, aged fifteen years, who had had no catamenial period. A fluctuating swelling the size of a fist was opened and curetted.

Berchtold's case (64) was an individual with phthisis and an old pleurisy, who had a hard, tender swelling in the right breast and an axillary abscess in the right axilla.

Hebb's case (67) was a woman, aged thirty-nine years, who had had hæmoptysis. She had had eight children, five of whom had died of

consumption. She presented a hard, movable tumor in the breast, and the lymphatics were enlarged to the axilla.

Kummer's case (77) was a child, aged sixteen years, with an axillary swelling extending toward the breast. An abscess had opened under the nipple. The sinus healed. Other abscesses opened. *Fistulæ* were present. The axillary glands were enlarged.

METHODS OF INFECTION. In primary mammary tuberculosis the tubercle bacillus must find its way into the organ through the milk-ducts or through an open wound of the nipple, as in Case 29 (Demme), or of the skin over the breast. If the primary infection is through the milk-ducts, the glandular acini will be first involved; if infection be through the wound of the skin, the interstitial tissue is first attacked.

Metastatic mammary tuberculosis or autoinfection, in which the infectious agent obtains access to the breast through the vascular channels from a tubercular focus situated in some distant portion of the body, is the most common form.

As a secondary disease through contiguity of structure, tuberculosis of the breast may follow caries of the rib or sternum, empyema of the chest, and tuberculosis of the axillary and neighboring lymphatic glands.

HEREDITARY INFLUENCES. Tuberculosis is not hereditary, but there still exists a well-founded notion based upon experience that a lack of resistance in the tissues to tuberculous infection is inherited.

Case 4 (Powers) had two sisters and a brother who died of phthisis. Case 10 (Mandry) and Case 28 (Sabrazes and Binaud) each had a tubercular family history. Case 29 (Demme), Case 48 (Ohnacker), Cases 53 and 54 (Piskacek), Cases 62 and 65 (Berchtold), and Case 78 (Bartels) all presented a tubercular history in the immediate family.

The existence of tuberculosis in the immediate family of any patient must be given its due weight in doubtful cases of breast tumor.

THE AGE. The majority of all the cases were thirty-five years old or younger. A number were under twenty years of age. The oldest case recorded was but fifty-three years. Mammary tuberculosis occurs in comparatively young adults—*i. e.*, during the period of functional activity of the gland.

ADDITIONAL TUBERCULAR FOCI. In many cases the facies of the patient was evidently tubercular. The well-recognized "scrofulous" diathesis was present, and, in addition, tubercular infection already existed in many different tissues remote from the mammary gland, the breast lesion being only one of two tubercular lesions in the same individual. The lymphatic glands of the neck, the bones of the elbow-joint, of the sternum and the ribs, the apices of the lungs, the epididymis, the sacro-iliac synchondrosis, the pleura, and the peritoneum, all manifested tubercular lesions.

PREVIOUS CONDITION OF THE BREAST. About half the cases had borne children, and the breasts of these women had been functionally active. About ten of the cases were reported to have had an inflammation of the breast at some time previous to the appearance of the tubercular infection.

Lactation was active during the development of the tubercular disease only a few times. Does an inflammation of the breast during the puerperal period predispose to a tuberculosis of the breast? In a series of 17,999 well-observed cases at the Boston Lying-in Hospital,¹ there were 92 cases of abscess of the breast. This is a low percentage of one-half of one per cent. It is not known, of course, that all these cases were free from tuberculosis.

In the cases here recorded there is over 13 per cent. of mastitis; that is, in the tubercular puerperal cases there is a greater frequency of abscess than in the normal puerperal cases. It may be that the tubercular infection finds a soil more favorable to its development in a breast once the seat of an inflammatory process. The percentage at the Boston Lying-in Hospital must not be taken as expressing the frequency of mastitis, for these cases are under observation there but a short time, and may develop after that period.

Inoculation experiments were successful in nine of the reported cases. Intraperitoneal inoculation of guinea-pigs was done in all but one case, in which inoculation into the eye of a rabbit was successfully tried.

Series of Cases in which Inoculation Experiments were made Successfully.

Case 5. Villar.

Cases 25, 26, and 27. Gaudier and Peraire.

Case 28. Sabrazes and Binaud.

Case 30. Ugo Pisani.

Case 49. Ohnacker.

Case 62. Berchtold.

Case 65. Berchtold.

In 3 of the 9 cases in which the inoculation was positive, no bacilli were discovered in the abscesses or breast tumor.

It is merely an interesting fact, in passing, to note that 4 of the tuberculous cases were men, and that 2 of the rejected cases were also men. These are the male cases of the accepted list:

Case 20. Porier.

Case 21. Hebb.

Case 22. Schede.

Case 29. Demme.

These are the 2 male cases of the rejected list:

Case 19. Horteloupe.

Case 40. Heyfelder.

¹ These statistics were furnished through the courtesy of Dr. Edward Reynolds, Boston Lying-in Hospital.

SUBJECTIVE EVIDENCES OF THE DISEASE. In about half of the cases reported *pain* in the breast is mentioned as an early and constant sign. In a few cases the pain was stated as severe. In the case reported by the writer, in which there was no acute inflammatory process at the time examined, the patient came seeking relief not so much from the discharging fistula as from the persistent pain in the breast.

In a large number of cases the disease is discovered by the patient when already well established. It offers no warning and proceeds in a quiet and peculiarly stealthy fashion.

The breast itself, often small and insignificant in advanced cases, at the beginning of the disease may be found enlarged, independently of the presence of an abscess or definitely defined tumor. This enlargement is due to the very great round-cell infiltration, giving an indurated, brawny feel to the part of the breast involved.

The nipple was retracted in only a few of the cases reported.

The tubercular process has appeared in the breast in variable forms, from a single small node or many nodules, firm in consistency, resembling lymph glands, seated in the periphery or scattered through the breast, to a hard, irregular, ill-defined lumpy mass the size of an orange in the centre of the breast gland. There are many gradations. These masses may be movable in or fixed to the breast gland. They may be immovably fixed to the pectoral fascia. The skin over these masses is usually unattached. These masses may extend well outside the mammary gland toward and even to and into the axilla of the same side.

As the tubercular process progresses these masses become somewhat less well-defined, their outlines are more indistinct; they seem attached to the contiguous tissues. There is a doughy, indefinable feel upon palpation. Still later in the evolution of the tubercular process, here and there throughout the presenting tumor, there is a softness felt; fluctuation is present. The skin is attached to some part of the softened area, the skin becomes red, ulcerates, and through the resulting sinus appears a discharge of pus and of a puriform caseous material.

It is interesting that in the majority of instances the masses in the breast which softened first did so near to the nipple. If suppuration in tubercular lesions necessitates the introduction of an infectious agent other than the tubercle bacillus, it would seem that the nipple afforded an easy entrance to the pyogenic coccus.

THE PROGRESS OF THE DISEASE. The tubercular process was characteristically a slow one in almost all instances. It occupied months and even years in its course from the time it was first noticed by the patient to the time that the disease was examined by the physician.

In the writer's case five years was the duration of the disease. Mandry (Case 14) reports a case of four years' duration.

In the following four cases the course of the disease is reported as

having been very rapid: Case 9, Habermaas (by Mandry). Case 12, Mandry. Case 21, Hebb. Case 31, Lane.

Case 31 was not proved to be tubercular. Cases 9, 12, and 21 may have had a secondary infection, therefore the rapidity of their progress.

FISTULA. In more than half the cases a fistula was present. A few cases showed fistulæ in the axilla. Multiple fistulæ were found in several instances. The openings of the fistulous tracts appear as ulcers with undermined bluish edges filled with pale, flabby granulations from which a thin puriform caseous discharge proceeds.

AXILLARY LYMPHATICS. In nearly all cases the axillary glands presented different stages of tuberculosis. They were at times hard or softened, small or large, and fistulæ were present from these axillary glands with the characteristic openings.

In so many instances the enlargement of the glands of the axilla preceded the manifestation of the disease in the breast that it is reasonable to suppose that it was primary in the axilla. This was very evident in Case 75 (Reverdin).

CAUSES OF DEATH. Few cases have been followed carefully until death.

In those reported as having died, Case 3 (Powers) died of phthisis four years later. Case 8 (Habermaas, quoted by Mandry) died of tubercular peritonitis. Case 16 (Billroth) died of tuberculosis, presumably miliary. Case 51 (Orthmann) died of tubercular pleurisy and pericarditis.

TUBERCLE BACILLI. In 29 cases the tubercle bacilli were found. Ugo-Pisani reports them in the pus from the abscess. Orthmann reports them as in the axillary glands. Piskacek reports them as in the pus of fistulæ. Roux and Hering report them as in the mammary gland and the axillary glands. Davis reports them as found, in his first case, in the tissues. *Microscopically*, the reported cases show the anatomical tubercle with characteristic giant-cells in the axillary glands, in the walls of abscess-cavities, in the acini of glands, in the walls of fistulæ, and in the new connective tissue. In a few instances macroscopic miliary tubercles were seen. In all instances the round-cell infiltration is very great. The breast tissue is found cirrhotic and often has nearly disappeared. The bloodvessels show an endarteritis. In many cases the bloodvessels are few in number (Bender and Poirier). The pectoral fascia and muscle are found involved in the tubercular process. From the evidence of the reported cases, carefully considered, it would seem highly probable that the occurrence of a purely primary tuberculosis of the mammary gland is extremely rare.

The so-called case of primary tuberculosis is secondary to a tubercular lesion in some other part of the body, if not due to contiguity of tuberculous tissue.

Spediacci, *Schmidt's Jahrb.*, vol. cexlvii., p. 148, 1895, from his experiments with the inoculation of guinea-pigs and rabbits, suggests that all tuberculosis of the mammary gland is secondary.

DIAGNOSIS. From the ordinary *pyogenic infections* tuberculosis may be distinguished by the absence of a sudden onset and acute inflammatory symptoms.

When the breast tumor is hard or firm other solid tumors must be considered, and the diagnosis is often difficult. From *carcinoma* of the breast tuberculosis is distinguished by the less isolated and softer feel of tuberculosis; tuberculosis occurs in younger patients; the axillary glands of tubercular subjects are involved early; in carcinoma the axillary glands are usually enlarged late in the disease. The firmness or extreme hardness of carcinoma is very characteristic; tuberculosis very rarely attains such board-like hardness. If present, the cachexia of the two diseases is very different. The clinical picture of tuberculosis is quite different in its details from that of carcinoma.

The *gummata of syphilis* may be distinguished from tuberculosis by the specific history and the positive results of antisypilitic treatment.

After softening of the tubercular tumor, whether in whole or in part, the diagnosis is attended with less difficulty. *Actinomycosis* of the breast is to be distinguished from a tubercular cold abscess and chronic fistulæ. The discovery of the actinomyces by the gross and microscopical appearances will make the diagnosis certain.

From *cysts* of the breast, the fluctuating tubercular tumors may easily be differentiated in that the breast-cysts are usually tense and firm. There is no inflammatory exudate about the breast-cysts, so that they are clearly defined, whereas the fluctuating swellings of tuberculosis are softer and often ill-defined.

As a help to diagnosis, Roswell Park¹ suggests that the discharge from the fistulous tract, the fluid from the fluctuating swelling, should be examined microscopically; if tubercular, it will show a lack of the granular débris and formed elements. The same discharge should be stained for tubercle bacilli. A guinea-pig should be inoculated with the suspected fluid. The inoculation-test will be final and satisfactory even when the microscopical examination proves to be negative. A bit of solid tissue may be removed and examined histologically and may be used for inoculation experiments. It is of value in this connection that in a case reported by Davis (82) tubercle bacilli were found in the discharge from the nipple previous to operation.

PROGNOSIS. The prognosis as to local recurrence and complete recovery after thorough removal of the breast and axilla and all glands is, of course, dubious in distinctly tubercular subjects and those in

¹ Surgery, by American Authors.

whom the mammary lesion is evidently due to auto-infection. On the other hand, in apparently healthy subjects, with few or small axillary glands (the disease appearing to be primary in the breast), the prognosis both as to local conditions and complete recovery of health is excellent.

TREATMENT. The following have been the methods of treatment in the reported cases :

1. Curetting of sinuses.
2. Cauterization of sinuses.
3. Removal of the tumor from the breast.
4. Removal of the breast and the tumor.
5. Removal of the axillary glands.
6. Removal of the breast and axillary glands.

Complete removal of all disease, including the whole breast and all the glandular contents of the axilla, is the only thorough treatment advisable.

It is possible to imagine a tubercular focus lying isolated in the breast-tissue which can be removed completely without sacrificing the gland itself. Practical experience proves, however, that partial operations are dangerous.

The old method of curetting tubercular abscesses and chronic fistulæ of the breast, in the hope of their healing, has been discarded. A better understanding of the pathological conditions present in the abscess-wall has changed this treatment to radical excision of all the disease with a wide margin. The wide margin is necessary, for tuberculosis extends further into surrounding tissues than can be seen with the naked eye.

In addition to operative procedure, the general constitutional and climatic treatment should be followed as in cases of tuberculosis in other parts of the body.

REVIEWS.

DISEASES OF THE STOMACH: Their Special Pathology, Diagnosis, and Treatment, with Sections on Anatomy, Physiology, Analysis of Stomach Contents, Dietetics, Surgery of the Stomach, etc. In three parts. Pp. 788. By JOHN C. HEMMETER, M.B., M.D., Ph.D. Philadelphia: P. Blakiston, Son & Co., 1897.

THIS work of three parts is consolidated into a single bulky volume of 788 pages. The book is unique in that it is by far the most voluminous single volume treatise on the subject published, and that apart from the small volume of Einhorn's (really a collection of monographs) it is—although perhaps not the first projected—the first American treatise on diseases of the stomach to appear.

Part First is devoted to the anatomy and physiology of the digestive organs, including a description of "Methods and Technics of Diagnosis." Part Second treats of the "Therapy and Materia Medica of Stomach Diseases." Part Third is termed "The Gastric Clinic," and concerns itself with the study of the different diseases of the stomach.

The author, although a comparatively recent laborer in this field, has, by virtue of natural ability, great industry, and marked enthusiasm, aided by certain other favorable conditions, accomplished a considerable amount of most admirable work which has formed the basis of his treatise. His enthusiasm in his specialty is unbounded; evidences of that are apparent from the outset, as in the preface, in which is evinced a self-satisfaction with his creation most commendable. This enthusiasm is only unfortunate in that it sometimes has led to the display of a trifle too much of the Ego, as it has to the origin, advocacy, and voluminous description of certain methods of research, which, although most commendable, are often impracticable of application by the general practitioner, for whom it is stated the book is intended.

At the start we cannot but enter a protest against the term "gastro-enterologist," often employed by the author in seemingly the sense that diseases of the digestive apparatus should be regarded as forming a distinct specialty, as is that of diseases of the eye and ear, the nose and throat; these being so often entered into without a preliminary thorough training in internal medicine. We cannot but feel sorrow for those falling into the hands of such specialists as may require the caution Dr. Hemmeter has seen fit to give on page 370: "Gastro-enterologists should not fail to perfect themselves in the technic of auscultation and percussion!" If those working in this line have not first had ample preliminary training in auscultation and percussion, and subsequent thorough application of these in hospital and private work, before they have turned their attention to a branch so intimately related to the broad field of internal medicine as not to be separated from it, they

should be posted as charlatans, and deprived of the power to practise on suffering humanity. But we feel sure that it is not to such of these that Dr. Hemmeter has meant to appeal, although a caution to such in the book would not have been inappropriate.

It seems a trifle needless to quarrel over the question of priority of introducing a tube into the duodenum (p. 669), or the gastro-diaphane into the colon (p. 103). Certain claims to priority of this sort, however just, are urged somewhat obtrusively, as if one might suppose such a procedure were patented and the danger of infringement of the same imminent. Concerning the claim of priority of illuminating the colon (p. 103), it must be remarked that it is unfounded, since in the published work of Heryng and Reichmann, on gastro-diaphany (*Therapeutische Monatshefte*, March, 1892), who had interested themselves in this subject since 1889, there is graphically illustrated the diagnostic value of transillumination of the colon. Their work was done with a water-circulating diaphane, an apparatus far safer for such exploration than that employed by Dr. Hemmeter. Dr. Hemmeter may, however, justly claim not only priority but, we think, isolation, when the question of introducing the diaphane into the ileum (!) is concerned. Concerning the use of the gastro-diaphane, by the way, we think the author has not dwelt sufficiently upon the sources of error in its application, such as occur through too great diffusion of the light, so liable to occur when lamps of high illuminating power are employed. It seems odd that mention is not made of the most admirable water-circulating diaphane, which possesses material advantages over the original apparatus of Einhorn, as the reviewer can testify. It certainly is the form that should be used with lamps of such high voltage as Dr. Hemmeter employs. This is especially true when illumination of the bowel is the object.

Dr. Hemmeter has shown a tendency to a little diffuseness leading occasionally to undue repetition. A commendable desire for prompt publication is doubtless the cause of any such blemish, as it is of certain defects in style and English here and there somewhat apparent. We cannot but say that we feel that it would have been better for publisher and author if the book had been a little less voluminous. We think that, with other matter that might have been curtailed, considerable in the chapters on Dietetics and the Diet Kitchen could have been omitted, as might also the introduction of expensive plates (tending naturally to increase the price of the book) illustrating the working of the author's kymograph in his description of ascertaining the condition of the gastric peristole—a method which, by the way, is scarcely practicable for general clinical employment. The reproduction of Fig. 21 (p. 131) as Fig. 40 (p. 716), and of Fig. 22 (p. 133) as Fig. 34 p. (428), seem unnecessary, from the undue amount of space thus consumed. In the effort not to omit an extensive bibliographic reference, authors' names and titles, and often title of publication and date, are repeated both in the text and at the close of the chapter. Concerning somewhat careless or little polished use of English here and there apparent, there may be incidentally pointed out the following: "Apparatuses" (p. 78), "digestive clinical pathologist" (preface). Figs. 21 and 40 are described as "from a case of persistent hyperacidity found in the eye of the tube." On page 139 the following occurs: "We have seen a number of cases whose stomachs were of natural size and where there was no disturbance, . . ." On page 274 it is remarked that "the use of

alcohol in any shape is totally unnecessary for the use of the human organism." "Potassium iodide may lead up to gastritis" (p. 395). A tendency to an unsightly mixture of English and Latin is a direction on p. 450: "3ss in ʒij aqua after meals." The "of water" would appear to better advantage in English. By "Bruce Jones" (pp. 382, 383) is probably meant Bence Jones.

More important of attention and correction are occasional slight errors in another direction: "alcohol free ether is as totally unnecessary for use in the application of the Uffelmann test to separate the lactic acid in the gastric filtrate as it is essential for employment with the aldehyde method proposed by Boas" (pp. 152, 153). Alcohol free ether is advised for use in the first and merely "ether" with the second. Toepfer's test is spoken of as one for free HCl alone (p. 148), whereas it also responds to the loosely bound HCl, to which the phloroglucin-vanillin gives no reaction. As concerns the occurrence of a rose-color reaction with the latter as an indication of the presence of traces of the mineral acids alone, it may be of interest here to record that the reviewer long ago showed that boric acid also gives a rose-hue response macroscopically identical with the reaction obtained from traces of a mineral acid. On page 669 one grain of salol evidently should read one gramme.

The directions concerning the application of lavage and the single and double gastric tube are, we think, scarcely given as minutely as the importance of the subject warrants. A thorough knowledge of the technique of the various diagnostic methods is of little utility without an exact comprehension of the needs and best modes of use of a remedy often so badly applied as to be useless or harmful. More space could have been devoted to describing the great value of douching in comparison with mere washing of the stomach, and as to the utility of other double-current spray tubes than those described. Einhorn's intra-gastric spray, which is unqualifiedly commended, will be often found to be impracticable through its introducing so much air into the stomach. Surely it is not intended that a 6 per cent. solution of HCl should be employed for lavage (p. 321). This would be effective enough in overcoming "decided fermentations," but would be hard on the stomach.

The statement (p. 377) that there is usually present in gastric carcinoma, as in malignant disease elsewhere, a constant increase in the number of leucocytes, varying from 10,000 to 50,000, is somewhat misleading. A leucocytosis, as concerns decided numerical increase, is not regarded as relatively very frequent in cancer of the stomach, and a marked grade of leucocytosis before extensive metastasis has occurred is unusual.

We are surprised to note that ergot is said to be of utility in "copious and persistent" gastric hemorrhage (p. 482). A consideration of the physiological action of ergot, with the repeated failures following its employment, if other measures really efficient are not coincidentally used, should soon convince one of its inutility. The writer (see *Medical News*, January 23, 1892, and *System of Practical Therapeutics*, vol. ii. p. 949), so convinced several years ago, never nowadays employs it in gastric hemorrhage.

On page 526 is recommended, as an aid to secure particles of the growth in gastric carcinoma, the employment of a stomach-tube which "although quite soft is provided with a sharp chisel-like edge around

the lower opening." Such a tube to be of utility as a curette, it should be needless to say, would be dangerous of application. We think that the author lays far too much stress on the diagnostic value of the discovery in the wash-water, in cases of suspected gastric carcinoma, of isolated cellular elements, whether showing karyokinetic figures and forms of mitosis or not. So, too, if, in the statement (p. 526) "nor should we always deny the existence of cancer when we find no fragments giving the typical histological structure of these neoplasms," *ever* was substituted for "*always*," it would be more exact. We think trained clinicians will not agree with the author that the actually characteristic rose spots of enteric fever ever occur in another disease, not even acute miliary tuberculosis (p. 550).

We think Dr. Hemmeter goes a trifle too far in holding that constipation occurring in chronic gastritis should never be treated by drugs. A mild laxative, such as a reliable preparation of cascara, is sometimes absolutely essential to supplement the agents he advises, as is also an occasional good-sized dose of calomel. The latter has an influence most far-reaching for good on other organs and parts than the stomach, which tend to derangement in this affection. His treatment of chronic gastritis is too much that of the stomach alone. Because extensive fermentation and formation of organic acids are of rare occurrence in this disease, it does not follow that saccharine articles of diet may be always permitted. We must consider the influence of these upon metabolic processes in the liver, as well as upon the intestinal condition.

The author's scepticism concerning the frequency of loose right kidney in women is somewhat remarkable, as is the statement that the rate for Baltimore is but 6 per cent. (!). He remarks that "a surprisingly large number of movable kidneys are diagnosticated by otherwise very skilful diagnosticians when they are really dealing with cases of descent of the liver." This seems indeed severe on these otherwise skilful diagnosticians. He regards, also, as the chief error in diagnosis the much less commonly present furrowed, partially separated portion of the right lobe of the liver. The reviewer has paid special attention to this matter for a number of years, and has examined for these conditions as a matter of routine. He is certain that he cannot be so misled. The percentage in which he encounters a palpable and often very mobile right kidney in his patients is at least 30. Evidently either preconceived notions concerning the infrequency of loose right kidney or the method of examining for it adopted, have prevented Dr. Hemmeter from discovering a condition which must be as common in Baltimore as elsewhere. It is most unlikely that the women of Baltimore, although perhaps superior in certain other respects to their Eastern sisters, are better able to sustain their right kidney in position, and that instead they have a too freely movable liver or the less common tongue-like projection cited. In a subsequent edition Dr. Hemmeter will probably somewhat modify his views of this matter. It is no unusual occurrence with the reviewer to be able to demonstrate a very loose right kidney in cases in which it had been overlooked by diagnosticians presumably skilled in the line of abdominal work who had referred the case for opinion. Not being on the watch for this condition, it had previously been either unsuspected or the method employed for its detection was inefficient. Concerning the question of the rarity of finding a loose kidney post mortem, which is adduced against its frequency in life—Dr. Hemmeter holding that the movability should per-

sist in death—Newman's most rational explanation seems to the reviewer sufficient: that the fatty envelope becoming solidified after death tends to fix a kidney which in life had been freely movable.

Enough has been said in the way of criticism of this—taking it all in all—really admirable book. The few points mentioned adversely are, in comparison with the vast expanse of valuable material, the merest trifles—details not detracting from the worth of a book which can truly be said to represent a monument of earnest intelligent work, reflecting credit on the author's skill as an investigator and compiler in this branch of medicine. We confidently commend it to those working in this special field who desire to be abreast of what is being done, and predict for it popularity and a large sale. Much praise is due the publishers for the most pleasing make-up of the volume. Their part has been truly perfectly done.

D. D. S.

THE PRACTICE OF MASSAGE: ITS PHYSIOLOGICAL EFFECTS AND THERAPEUTIC USES. By A. SYMONS ECCLES, M.B., Member Royal College of Surgeons, England, etc. Second edition; pp. xii. 372. London: Balliere, Tindall & Cox, 1898.

THE first edition of this book was reviewed in this JOURNAL for April, 1896. The present edition is practically a reprint of the first, but under the auspices of another publisher. Although nothing of great importance, so far as concerns massage, has presented itself in the time which has elapsed between the two editions, and for this reason no radical changes should be expected, yet the revision as claimed in the preface ought to have been sufficiently thorough to correct the typographical errors of the first, some of which were alluded to in our previous review. Not only has this not been done, but the objectionable tales denominated histories of patients are retained. The book, in spite of its obvious defects, really is a valuable one for the physician. We regret that opportunity for its improvement has not been accepted.

R. W. W.

PICTORIAL ATLAS OF SKIN DISEASES AND SYPHILITIC AFFECTIONS, IN PHOTO-LITHOCHROME, FROM MODELS IN THE MUSEUM OF THE SAINT LOUIS HOSPITAL, PARIS. With explanatory wood-cuts and text. By E. BESNIER, FOURNIER, TENNESON, HALLOPEAU, DU CASTEL, H. FEULARD, L. JACQUET. Edited and annotated by J. J. PRINGLE. Part XII. London: The Rebman Pub. Co. Philadelphia: W. B. Saunders, 1897.

THE part of this valuable work before us concludes the *Atlas*, which must be regarded as an admirable exposition in color of some of the many beautiful models of the famous Saint Louis Hospital Museum. Some of the diseases represented are rare, while others are common, all of them being well chosen. The drawing and coloring of the plates throughout the work are excellent, and the text is not only explanatory but instructive, in some instances amounting almost to small monographs—as, for example, the article by Fournier on Syphilitic Chancre of the Lip. Part XII. contains Syphilitic Chancre of the Nostril, Lip, and Tongue; Xeroderma Pigmentosum; Impetigo Contagiosa, and Urticaria Pigmentosa.

L. A. D.

PROGRESS OF MEDICAL SCIENCE.

THERAPEUTICS.

UNDER THE CHARGE OF

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The Saponins.—M. G. POUCHET points out that these occur in a very large number of plants under a variety of names, as, digitonin, gratiolin, lychnin, githagin, senegin, cyclamin, smilacin, quillagic and polygalic acids. These, which might better be called sapotoxins, differ much in their therapeutic and toxic properties. The method of preparation also has much to do with their activity: by maceration the plant may yield substances of remarkable toxicity; if isolated by appropriate chemical methods they may be almost inactive. If obtained by the latter method they occur as an amorphous powder, which varies in color from white to yellow, and is first of a sweetish, later of a bitter, styptic and burning taste. They are soluble in all proportions in water, slightly or not at all in alcohol. They may be divided into two groups: (1) Neutral or (2) of acid reaction. The latter are distinguished by their solubility in alcohol and by their marked toxicity. They are all lævogyre, their aqueous solutions form emulsions, and they dissolve without water in such substances as lead sulphide and barium carbonate. Chemically they are glucosides. Physiologically they act upon the heart, more or less, as does digitalin, but they show in addition an intense action upon the medulla, which manifests itself by convulsions and asphyxia, from which the animals experimented upon die. They are poisons to the central nervous system and to the heart. If given by the mouth their action upon the nervous system is *nil*, but they irritate more or less violently the intestinal mucous membrane, and further, they are caustic. When given hypodermatically they determine death of the tissues at the point of injection. The acid varieties given intravenously produce results differing according to the doses. If these are large, death follows in a few seconds, preceded by convulsions and paralysis of the nervous centres. In smaller doses dysenteric manifestations are present (hyperæmia, bloody extravasations, œdema of the wall of the intestine, hyaline thromboses, necrosis of the mucous membranes).

Further, ecchymosis and necrotic patches have been found in the pericardium. Then death occurs after some hours. From small doses symptoms of poisoning come on more slowly, and death from collapse supervenes. There are no intestinal symptoms, but a marked lowering of temperature precedes the fatal issue. They dissolve red blood-corpuscles and cause hæmaturia. If the mucous membrane is healthy they are absorbed with difficulty; if abraded they are likely to give rise to symptoms of poisoning. Repeated applications to the skin produce a painful pustular eruption followed by sloughing. Calling attention to the reputation which senega has among the Indians as a remedy for snake-bite, it is suggested that the saponin contained in the root may be antitoxic to venom, comparable or even identical with the antitoxin contained in Calmette's antivenin. Bretonneau recommended senega for the treatment of various bronchial and pulmonary diseases. It slows the pulse and increases cough and expectoration, but should not be exhibited when the stomach is in bad condition, nor in fever. Nor, indeed, should dentifrices containing saponin be employed unless the gums are healthy. Further, it is believed that many of the symptoms and even the lesions which are common in poisoning from plants containing these substances should be attributed to them.—*Bulletin Général de Thérapeutique*, 1898, 6e liv., p. 193.

Strophanthus in the Treatment of Cardiac Disease.—DR. H. JACOBÆUS makes use of the tincture, reporting nine instances. In under-compensated hearts this remedy can be used for many months without interruption, without producing digestive disturbances. Cumulative effects (so-called) are not so often seen as from digitalis. The method of administration is to commence with daily amounts of twenty drops, gradually increasing to double this amount, and as soon as diuresis and improvement in general and circulatory conditions result, to return gradually to the initial amount.—*Klinisch-Therapeutische Wochenschrift*, 1898, Nos. 11, S. 346; 12, S. 390; 13, S. 430; 14, S. 462.

Are the Fluid Preparations of Digitalis Active when Manufactured into Tablets?—DR. E. M. HOUGHTON has conducted some very careful experiments upon animals, for in this way can be exactly studied the action upon the various organs. It was developed that the quantity of active constituents in different samples, as shown by physiological examination, varied considerably. The fact that some tablets have been demonstrated to be inert is quite likely due to this variation; the fault then being in the fluid preparation and not in tablets made from it. The general conclusion is that active fluid preparations of digitalis do not lose in activity by being made into tablets, nor do the tablets become less active by keeping, than do other preparations of digitalis.—*Therapeutic Gazette*, 1898, No. 4, p. 217.

The Treatment of Diseases of the Heart.—DR. R. DOUGLAS POWELL, in writing of digitalis, believes that the more common mistake is the prescribing of too large a dose at first, which tends to produce premature arterial contraction and cumulative effects. Then, with the appearance of these physiological symptoms the drug is stopped, and other medicine substituted, until the pulse calls for its administration. In this hap-hazard way the heart is never held in good control. If there is urgent need to push the drug, digi-

talin is best used subcutaneously. In ordinary cases a dose of 10 minims of the tincture every four, or 15 every eight, or 5 minims every waking hour is sufficient. This given, the patient being at rest, it generally takes about three days before the pulse is under control and the urine begins to increase. When decided effects are produced the drug should be steadily continued in doses calculated to maintain its effect. With ordinary watchfulness there is no risk; timely warning of excess is given by the pulse, which, having become slow, begins to exhibit small intermediate beats, and especially a tendency to go in couples. The sickness which comes with the drug is best relieved by an occasional mercurial or a change to digitalin, or a tumblerful of hot water taken occasionally. In some cases it may be necessary to omit the drug altogether.—*British Medical Journal*, 1898, No. 1944, p. 869.

Experimental Thyroidism.—DR. R. H. CUNNINGHAM presents the results of a careful review of the literature and painstaking laboratory work as follows: (1) Absolutely fresh thyroid gland is not poisonous, in the usual sense of the term, when absorbed through the alimentary canal. (2) The symptoms of induced thyroidism are manifestations of an intoxication resulting from the ingestion of decomposed thyroid material. (3) The so-called experimental thyroidism is not specific for the thyroid only, for the ingestion of many substances derived from animal tissues other than the thyroid gland may produce an intoxication strikingly similar in every respect to that of experimental thyroidism. (4) Most, if not all, animal tissues yield substances which, if injected in large quantities directly into the circulation or beneath the skin, will produce an intoxication often very similar to that produced by injections of various substances derived from the fresh thyroid tissue. (5) The effects resulting from the intravascular or subcutaneous injections of aqueous extracts, decoctions, and the concentrated extractives of the thyroid tissues, of the thymus, of muscle, etc., are by no means necessarily indicative of the function and the action of the hypothetical internal secretions of the same tissues during life. (6) The utilization of the fact that ingestion of decomposed thyroid material produces on certain occasions an intoxication with certain symptoms similar to some of those of Graves's disease is not justifiable for the furtherance of the theory that the symptoms of exophthalmic goitre result from an over-production of the thyroid secretion. (7) The results of this investigation lead to the conclusion that the fresh thyroid tissue yields at least probably two substances that are capable of palliating the symptoms of the acute cachexia in totally thyroidless dogs. (8) The thymus tissue also yields one and probably two substances that are equally capable as the thyroid extractives of palliating the acute cachexia of totally thyroidless dogs. (9) Neither of the above substances is an enzyme, nor does either contain iodine. (10) Neither the feeding of minced raw thyroid glands nor the injection of aqueous thyroid extracts, decoctions, and concentrated solutions of the extracted palliative thyroid principles is capable of keeping totally thyroidless dogs alive longer than a few weeks (possibly three weeks). Still less capable are the thyroid preparations containing decomposition products. (11) The presence of one, or usually several, small accessory thyroid bodies which gradually hypertrophy and wholly or partially assume the functions of the excised thyroid lobes, accounts for the occasionally long

survival of thyroidectomized, thyroid-fed young dogs. (12) Totally thyroidless dogs are so quickly overwhelmed by the cachexia, and the intervals between the thyroidectomy and the onset of severe dyspnoëic attacks and the subsequent death differ so slightly, no matter which of the usual varieties of fresh food are employed, that various kinds of fresh food cannot be unquestionably affirmed to influence the onset of the cachexia in any especially definite manner. Animal foods, in which constituents poisonous to rabbits have developed, probably slightly hasten the onset of the severer symptoms, and the vaunted remarkably modifying influence of a diet of ordinary milk does not exist in the case of the totally thyroidless dog. (13) Monkeys, whose general metabolism is disturbed in consequence of the removal of a greater portion of the thyroid gland, evidently become more susceptible to those constituents of meat that are poisonous to rabbits; and sufficient clinical knowledge exists for concluding that probably a like susceptibility to animal foods containing such constituents also exists in men when the function of the thyroid gland is sufficiently disturbed. (14) As regards the thyroid factor in the pathology of exophthalmic goitre, the majority of the symptoms in many patients with that disease can apparently, from an experimental standpoint, be as plausibly explained by the hypothesis of partially deficient thyroid activity as by the hypothesis of augmentation of thyroid function.—*Journal of Experimental Medicine*, 1898, No. 2, p. 147.

The Treatment of Lithæmia.—DR. ALBERT C. BARNES believes that the two cardinal rules which sum up the whole subject are: (1) Eliminate the toxic agents which cause the symptoms, and (2) avoid nitrogenous food, from the metabolism of which the toxic agents result. Milk, vegetables, and cereals are the best food; the patient should eat sparingly and of simple food; over-indulgence should be particularly cautioned against, because this is the cause of many cases. To proscribe proteids entirely means to eliminate most of the ordinary articles of food, and is practically impossible. Some nitrogen in the food is required to replace waste. Meat, fish, poultry, eggs, tea, and coffee should occupy an inconspicuous place in the dietary, while carbohydrates, fats, and milk should make part of the list from which the patient may choose. Vegetables in general and fruits are well borne; so also are cereals and small quantities of cheese. Salads of all kinds, fries, sweet articles, and malt liquors are to be avoided. As for eliminants: the treatment is best begun with either a brisk mercurial purge or with small doses of calomel and sodium bicarbonate until free catharsis is produced. If constipation is a marked feature, this must be overcome by carefully adapted doses of cascara with glycerin. The best general eliminants are sodium phosphate and lithium bitartrate. The last is the best diuretic of the lithium salts, and seems to have a specific power upon the alloxuric bodies which are probably the cause of the manifestations. In most cases sodium phosphate has a desirable laxative effect, and its cholagogue action is particularly valuable. This may be given in drachm doses once daily, preferably in a glass of hot water before breakfast, and lithium bitartrate may be taken in five to ten grain doses three times daily in a glass of water. The latter should be given about four hours after a meal. The value of the salicylates in the treatment of lithæmia is decidedly negative. Their powers of elimi-

nation have been greatly over-estimated. It is true that their ingestion is followed by increased excretion of uric acid, but this is due to an increased production of this constituent. It is well known that the salicylates increase leucocytosis; and, as Horbaczewski demonstrated, much of the uric acid excreted comes from the catabolism of the nuclein of the leucocytes. It is, therefore, manifestly improper to administer a remedy which causes increased production of any of the alloxuric bodies. Just at this point the writer would express an opinion, based upon several years of clinical observations, concerning the therapeutic value of the salicylates in those affections for which they are commonly given. In acute rheumatism they are of decided value as analgesics; but in many cases of chronic rheumatism, and in all cases of lithæmia and gout, they are of doubtful therapeutic effect. The excretory activity of the skin is best maintained by frequent bathing. Hot-water baths, taken either every day or on alternate days, are of positive value in the treatment of lithæmia. The reputation of the many lithia waters is probably due more to the water they contain than to any of the salts; at any rate they are not to be relied upon exclusive of other medication. Good pure water, taken frequently during the day in liberal quantities, is to be commended. The general treatment above detailed, viz., the use of a non-nitrogenous diet and frequent bathing, the administration of sodium phosphate and lithium bitartrate, will generally suffice to rid lithæmics of not only the distressing bilious and migrainous paroxysms, but also of the symptoms referable to the gastro-intestinal tract. It is often necessary to treat individual symptoms when pronounced enough to occasion distress. In those cases in which the symptoms of acid dyspepsia are more or less constantly present, which symptoms occasionally culminate in an attack of biliousness or "sick headache," the remedy popularized by Griffith has given excellent results. It is an alkaline aromatic, the formula of which is: Oil of cloves, 2; sodium bicarbonate, 4; chloroform, 1; compound tincture of cardamom, 48; of which a teaspoonful is to be taken after each meal. The writer has found the efficacy of the above mixture increased by the addition of the oil of cajuput in doses of from five to ten minims. In this class of cases, particularly those in which there are present much flatulence and other symptoms of intestinal indigestion, associated with headaches, a compound tablet of bismuth beta-naphthol, containing bismuth beta-naphthol, 3; eucalyptol, $\frac{1}{4}$; guaiacol, $\frac{1}{4}$; thymol, $\frac{1}{8}$ gr.; given three times daily, is of value. The best results are obtained in the general treatment of lithæmia by adopting a brisk eliminative measure during the first two weeks, then reducing the quantities of the drugs for the second fortnight, then again reducing to a minimum, or intermitting them entirely for the fifth and sixth weeks. In many cases small doses of sodium phosphate and lithium bitartrate given continuously, will keep the symptoms in abeyance.—*Medical Record*, 1898, No. 1429, p. 439.

[The writer apparently does not recognize the fact that the distinction between a meat and a vegetable diet is one of terms rather than of fact. Both are nitrogenous, with the difference that the vegetable albumins are more difficult of oxidation. Further, milk is also albuminous, although it seems to play an important part in diet lists supposedly consisting of carbohydrates and fats in large part.—R. W. W.]

The Effect of Peptones and Albumoses on the Kidney.—DR. W. H. THOMPSON gives a preliminary communication dealing with the influence of peptones and albumoses on the kidney when injected into the circulation. The following is a short summary of the results: (1) These substances do not exert so great an influence on the walls of the kidney bloodvessels as they do on those of other splanchnic bloodvessels. (2) They cause a marked increase in the secretion of urine, the maximum occurring during the second hour after injection. (3) The urine secreted is dilute, its percentage of urea and total nitrogen being diminished. (4) The total amount of urea and nitrogen is, notwithstanding, considerably increased. (5) Part of the peptone (or albumose) is excreted during the first hour after injection, but the greater part appears to be retained. The amount so retained, however, is not sufficient to supply enough nitrogen for the increased output of urea and other nitrogenous compounds. He points out that these results were in accordance with what we already know of the diuretic influence exerted by proteid food-stuffs, and also with the period after injection at which their maximum effect is produced.—*Medical Press and Circular*, 1898, No. 3071, p. 277.

Urotropin.—DR. LEOPOLD CASPER finds that this substance does not dissolve uric acid any more than does water. After the entrance of urotropin into the organism some is decomposed into formaldehyde. From experiments it was found that the former was always detected in the urine and sometimes in the blood; the latter sometimes in the blood and generally in the urine. The reason of this is probably that there is a combination of formaldehyde with albuminous substances in blood or urine so that its presence cannot be determined. As to the elimination of urotropin and formaldehyde, both are found after ten minutes have elapsed since its administration. Fourteen days after the last dose the urine of a patient showed both substances; generally the period of elimination is shorter. Clinical reports are appended showing the value of this remedy in phosphaturia, severe ammoniacal cystitis, and long-standing severe pyuria.—*Monatsberichte der Krankheiten des Harn- und Sexual-Apparates*, 1898, No. 1, S. 1.

Dosage in Anæsthetics.—DR. A. WALLER looking closely into the reports of deaths, it appeared that these had occurred because chloroform had been improperly administered, from ignorance or carelessness, probably the former. Snow, forty years ago, made a statement that to produce the second stage of anæsthesia, 12 minims of the anæsthetic [chloroform] in the blood are necessary; to produce narcotism of the third degree, about 18 minims are necessary; while to produce full surgical anæsthesia, 24 minims are required. To produce death requires double the minimum amount which produces the minimum amount of anæsthesia, namely, 36 minims. From the results of physiological work it came out with remarkable coincidence that the lethal dose of chloroform was twice the anæsthetic dose. If a rough calculation of the average fluids of the body is taken, the amount of chloroform present in the blood which is necessary to anæsthetize a mammalian animal, including man, is between 1 and 2 per cent.; the maximum should not be exceeded. Toward procuring safety in administration, the first step is to recognize the fact that, as regards the rough and ready use of an anæsthetic, one may not

take chloroform and ether as being at all on the same footing. In using the former we deal with a weapon seven times as powerful as is ether. This is especially important in minor surgery, for it is here that nine-tenths of deaths from anæsthetics occur. As to the safe use of chloroform, it was a question of measurement—a question of quantity per time—that must be aimed at in order to abolish death by chloroform. There should be some agreement as to quantity among anæsthetists. Uniformity of strength cannot be obtained in an “open method” of inhalation. Some method must be adopted which shall enable the anæsthetist to know how much chloroform is being given per minute.—*The Clinical Journal*, 1898, No. 284, p. 426.

MEDICINE.

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Persistent Ductus Arteriosus Demonstrated by X-rays.—ZINN (*Deutsche med. Wochenschrift*, 1898, No. 11, Vereins-Beilage) reports a case: A woman of thirty-seven years had always been delicate as a child, menstruated first at twenty-six; had a rickety pelvis, but was able to work as a domestic and complained only of dyspnoea on exertion. Physical examination showed pallor, no cyanosis, the terminal phalanges clubbed, nails poorly developed. The heart-dulness extended from the right edge of the sternum to within a finger-breadth of the left nipple line. From the first to the third left intercostal spaces there was an area of dulness five to six centimetres wide. There was a thrill over the area of heart-dulness, strongest in the first left interspace, and a very loud systolic murmur, with weak first and accentuated second sound. In the great vessels the loud murmur was also audible. On examination with the fluorescent screen the position of the heart was readily made out, corresponding to the area of dulness, and also a dark area corresponding to the one in the second and third interspaces. This was no doubt the dilated pulmonary artery, the occurrence of which in case of persistent arterial duct was shown by Gerhardt.

Tic Convulsif in a Case of Hemiplegia.—HABEL (*Deutsche med. Wochenschrift*, 1898, No. 12) has observed this very rare occurrence. Tic began in 1895, in the left side, about the same time with severe and repeated epistaxis, but continued after the bleeding stopped. In August, 1897, apoplexy came on without prodromes. Loss of consciousness lasted an hour, and was followed by aphasia and complete left-sided paralysis. In a few days speech

returned and motion was possible in the left leg, but the arm was still paralyzed. On admission there was hemiplegia with contracture of the left arm. The inferior facial nerve was paralyzed, but the left side of the face was the seat of an exquisite tic convulsif. Several times a minute the angle of the mouth and the alæ nasi were drawn up by clonic contraction of the affected muscles. The spasm continued during sleep, and was not influenced by eating. Excitement rendered it more frequent. Sensibility of the face was preserved. The other conditions were as in any case of hemiplegia. The case illustrates an experiment of Cadiot, Gilbert, and Roger, who removed successively the cortical centre and hemisphere in a dog that for seven years had tic convulsif, without affecting the spasms, which only ceased after the facial nucleus in the pons was destroyed. In Habel's case the author thinks the symptom was due either to a direct irritation of the facial nerve at the base of the brain or to a reflex. The latter supposition is based on the history of nose-bleed in the beginning, a redness of the mucous membrane in the posterior nares, and the relation of tic in certain cases of nasal polyp to the latter.

Thyroidism and Basedow's Disease.—NOTTHAFT (*Centralblatt f. inn. Med.*, 1898, No. 15) makes a suggestive contribution to this interesting subject. A man of forty-three, always healthy, not neurotic, of good habits, began to take treatment for increasing obesity. Failing to get satisfactory results by various reduction methods, he began, without medical advice, to take thyroid tablets. These, of five grains each, he took in doses of from nine to forty-five a day, and in about five weeks had taken almost a thousand. The loss of weight during this time was thirty pounds (from two hundred and twenty). By the end of the third week, while taking thirty tablets a day, the patient began to cough, and about the same time the neck began to swell. By the end of the fourth week there were palpitation and loss of sleep, later thirst. He reduced the number of tablets, and in the beginning of the sixth week consulted the author. The circumference of the neck had increased three centimetres, the patient was excitable, depressed, could not sleep, the latter depending partly on the exaggerated beating of the carotids. It appeared that the loss of weight came on suddenly, about the time the subjective symptoms began. On examination it was found there was exophthalmos, thick neck without visible enlargement of the thyroid, but the latter could easily be felt to be enlarged. There was moderate tremor, the skin was cool and moist. The pulse was soft and regular, 120 in the minute; the carotid and brachial arteries pulsated visibly. The apex beat was in the fifth interspace inside the nipple line, strong and diffuse. Graefe's and Stellwag's signs were present, but the pupils, reaction, vision, and adduction were normal. The urine, amounting to three litres a day, contained 1 per cent. of glucose. The thyroid medication was stopped, a hypnotic and Fowler's solution ordered. In ten days the psychic symptoms improved, the others later, and in four weeks the tremor, glycosuria, and tachycardia had stopped, but the struma, exophthalmos, and other ocular symptoms persisted half a year, and then gradually subsided. After gaining ten pounds the patient began to take five-grain doses of iodo-thyrin three times a day, without bad effects. It is important to note that in this case some of the characteristic symptoms of

so-called thyroidism were absent, viz., headache and rheumatic pains. For these reasons the author seems justified in looking on the case as one of Basedow's disease due to excessive thyroid consumption. A symptomatic Basedow's disease on the basis of a thyroiditis seems negatived by the absence of fever and local signs. The article ends with a theoretical discussion of the nature of Basedow's disease, in which nothing new is brought out, but which covers the previous literature quite thoroughly.

Beri-beri in Sucklings.—HIROTA (*Centralblatt f. inn. Med.*, 1898, No. 16) has made an important observation on a disease in infants nursed by mothers with beri-beri. It has been thought that beri-beri never occurred in children before the second dentition. The author, however, has been able to see fifty-two cases of the affection in infants of from one to thirteen months. All were nursed by women with beri-beri. Five died, five more could not be followed up. Medicines had no effect on the symptoms, but all the cases that recovered did so within a few days after the patients were put on cow's milk, condensed milk, or nursed by healthy women. From the rapidity of the improvement it could hardly be thought that the symptoms were due to anything but an intoxication from the milk. A comparison of the symptoms shows a close resemblance with those of beri-beri in the adult. Diarrhœa, uncommon in adults with beri-beri, was sometimes present, and the indican reaction almost always present in beri-beri was absent (perhaps on account of the diarrhœa). The author looks on these observations as proving that beri-beri is the result of an intoxication, although he has been unable to find the toxic substance.

Valsalva's Experiment in Open Pneumothorax after Costal Resection as a Measure of the Expansibility of the Lungs.—REINEBOTH has made some interesting experiments on this subject, taking sphygmograms while the patient made expiratory efforts with the mouth and nose [or the glottis] closed. A number of clinical histories are cited, with tracings, which indicate that the method may have considerable prognostic value. In order to obtain trustworthy results it is essential that the resection opening permits the passage of air, and cannot be closed by the lung or diaphragm. In case of pneumothorax of large size the sphygmogram taken during Valsalva's experiment will not show the usual rise of venous congestion if there is a large fistulous opening between the bronchial tree and the pleura, or if the affected lung is capable of expansion. If we can exclude the first possibility the method indicates whether the lung is impossible or difficult to expand. From the author's results the method seems more reliable than the manometric one, or that by filling the cavity with water.—*Deutsches Archiv f. klin. Med.*, Bd. 60, p. 111.

The Blood Changes in Typhoid Fever.—KÖLNER (*Deutsches Archiv f. klin. Med.*, Bd. 60, p. 221) has made extensive examinations which confirm a number of previous observations and clear up certain contradictions. The author is at times too optimistic. He thinks the leucocyte count is of value in distinguishing typhoid fever from general military tuberculosis, but both Cabot and Warthin have shown that the latter disease, like typhoid fever,

may show a subnormal number of leucocytes. In uncomplicated typhoid fever Kölner never observed leucocytosis. Usually the number was subnormal, even as low as 1000 per c.mm. There was no positive relation between the number of the leucocytes and the temperature. In some cases the count fell as the disease became worse. The author thinks that in general the number of leucocytes is less in the second and third than in the first and fourth weeks, and that in convalescence the leucocytes increase, sometimes above normal. Age does not seem to affect the results. [The author did not examine any cases in children.] The condition of the leucocytes in the complications of typhoid are interesting. In many cases with suppurating complications [streptococcus pneumonia and otitis media, decubital abscess, bronchitis], in intestinal hemorrhages [two out of three cases] there was no increase of leucocytes above normal. In one case of hemorrhage there was temporary leucocytosis [to 9300], and in a case with severe course and obscure abdominal symptoms there was increase to 11,200 leucocytes. The author properly warns against placing too much reliance on the blood examinations alone, but thinks the hypoleucocytosis more reliable than roseolæ, enlarged spleen, typhoid stools, or the fever course. Prognostic value the matter has none. Kölner found the red corpuscles constantly diminished in typhoid fever, the hæmoglobin also, and to a greater degree. These began very early, though sometimes masked by various conditions that cause a concentration of the blood. The hæmoglobin usually reached its lowest point before the end of the defervescence, but sometimes remained at this point or even continued to fall. In some of the latter cases there were explanations for the further fall in the faulty nutrition of the patients. In convalescence the improvement was rapid, usually in proportion to the previous fall, and the corpuscles often showed greater variations than the hæmoglobin.

Intestinal Auto-intoxication at the Congress for Internal Medicine.—The discussion showed slight tendency to unanimity, both as to pathology and therapeutics. MÜLLER held that intoxications from the intestinal tract are not auto-intoxications properly speaking, because they are due to saprophytic germs in the stomach and intestines. Many so-called auto-intoxications are really instances of unrecognized food-poisoning, not necessarily due always to toxins or toxalbumins. It is very doubtful whether albumin-putrefaction in the intestine causes symptoms of poisoning; the products of intestinal germs are very slightly toxic. But the occurrence of autochthonous decomposition of the intestinal contents cannot be doubted. The severity of the symptoms in many cases of gastro-intestinal disease, especially in children, points to the possibility, as do also certain skin diseases (*e. g.*, urticaria) occurring in the course of intestinal disturbances. So-called idiosyncrasy is often vasomotor anomaly from an intestinal reflex. Müller condemned the French doctrine of auto-infection as exaggerated, resting as it does partly on erroneous ideas about the normal bacteria of the mouth, pharynx, etc., and claimed that what is called auto-intoxication is really infection acquired often by contagion. Müller decried all medicinal so-called intestinal antiseptics. Calomel is cathartic rather than antiseptic. Lavage and cathartics are useful. BRIEGER spoke of the lack of exact chemical knowledge on the subject, and especially that regarding the toxicity of the urine. The potash

salts of the urine are innocuous to human beings; Bouchard's urotoxic coefficient is a very doubtful factor. The toxicity of the urine can only be considered established when the poisonous substance has been isolated, and in any event is not very great. As to intestinal antiseptics, BRIEGER agreed with Müller, though suggesting the possibility of serum antitoxin treatment. ALBU held to the theory of auto-intoxication in many cases rather than the antiquated and inadequate reflex theory, though admitting the impossibility of chemical proof at present. Not only Bouchard's urine method, but also Albu's own method, by testing the toxicity of blood-serum, is unreliable, though from experiences with these we may infer that in many cases spontaneous changes in the physico-chemical conditions in the body set up abnormal metabolic changes. QUINCKE recommended yeast in pure culture, up to 150 c.cm. internally, as a remedy for intestinal decomposition. ROSENHEIM also had used yeast with success, but recommended menthol also. STERN and FÜRBRINGER claimed a certain value for calomel. BOAS said that in intestinal auto-intoxication there was often a renal insufficiency. Calomel acted at the same time on the bowels and kidneys. For excessive formation of intestinal gas salicylic acid was useful. STRAUSS had found both menthol and thymol useful in preventing the putrefaction of stools.—*München. med. Wochenschrift*, 1898, No. 17.

The Urine in Pneumonia.—F. PICK, at the recent Congress for Internal Medicine, called attention to a change in the urine in pneumonia not hitherto noticed. In twenty-four to forty-eight hours after the crisis the urine shows a marked fall in acidity, becoming neutral or even alkaline. This phenomenon, observed in thirty-one out of thirty-eight cases, remains for a day or a day and a half, and then the acidity returns. Pick explains the change as perhaps due to the absorption of the exudate, especially of the large quantities of sodium in it.—*München. med. Wochenschrift*, 1898, No. 17.

The Water and Alkali of the Blood in Nephritis and Uræmia.—BRUNER (*Centralblatt f. inn. Med.*, 1898, No. 18) reports some observations that if confirmed and extended will add much to our knowledge of some obscure conditions. One of the most constant alterations in the blood in nephritis, according to him, is an increase of water in the serum. This has no constant relation with œdema. The blood-serum may be more dilute in cases with excessive diuresis and slight œdema than with the latter conditions reversed. It is difficult to discover whether albuminuria has any influence on the dilution of the serum, and if so, how much. Most evident and certain is the effect of uræmia on the blood as a whole. Distinct symptoms of uræmia were always associated with dilute blood, without regard to œdema, albuminuria, and amount of urine. In one case the difference in the amount of water in the uræmic and free stages was 3 per cent. In another case, in the free period, with marked œdema, there were 17.22 per cent. of solids; in the uræmic stage, with slight œdema and 1500 c.cm. of urine, 14.80 per cent. The dilution of the blood in uræmia seems to depend on an increase of the serum. In one case of uræmia there was no dilution, but on the other hand, the author observed no instance of greatly diluted blood without uræmia, although in chronic nephritis with cachexia this, of course, occurs. In the cases in

question the uræmic symptoms were well marked. The author thinks that examinations of the blood may clear up the classification of the various states included under the term uræmia. He also thinks that cedemas and dropsies are modes of preventing an excessive dilution of the serum, and remarks on the fact that nephritic patients often feel comparatively well as long as the dropsies persist. Another characteristic of the blood in nephritis is the decrease in sodium, which also probably has an important rôle in the pathology of the disease. Practically, the author thinks the variations in the water of the blood may be of value in the prognosis. The determination may be made by Stintzing's method, with a few drops of blood, though it is better to use larger quantities, taken with a wet cup or a syringe. The use of cathartics to produce watery stools in uræmia receives a rational explanation from these observations, and the systematic use of large amounts of sodium salts seems worth trying.

SURGERY.

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A Fatal Case of Forcible Reduction in Pott's Disease—VULPIUS (*Cent. f. Chir.*, December 11, 1897), speaking of forcible reduction in Pott's disease, recommends that spinous processes be connected together by small bone periosteum flaps, so that later they may become united by a bony band of union. In applying the plaster-of-Paris jacket he advises that the patient be suspended after the correction in the ordinary manner employed when applying these jackets—that is, in a vertical position, after the correction has been effected. The application of the jacket is greatly facilitated by this manœuvre, and it seemingly has a beneficial effect upon the action of the anæsthetic.

The author reports the death of a five-and-a-half-year-old boy during this operation while the jacket was being applied in the manner usual in these cases. After the forcible extension and during the application of the jacket, clonic cramps in the limbs, gnashing of the teeth, and contracted pupils ushered in a collapse that was fatal, and from which the patient was not resuscitated by removing the jacket and restoring the curvature. A partial post-mortem only was allowed, and disclosed no sufficient cause in any injury of the cord or its membranes.

Idiopathic Dilatation of the Colon.—In reference to the cases reported under this title, TREVES (*The Lancet*, January 28, 1898) says that it is safe to say that in certain portions of the alimentary canal extensive dilatation may occur which is independent of any obstruction of the lumen of the tube. To such forms the somewhat vague term "idiopathic" may, with a scarcely less vague reason, be ascribed.

The cases reported may be divided into two classes. In one series of cases the patients are adults, are mostly males, and are over fifty years of age. In the second series of cases the patients are children, and symptoms of abdominal trouble have been more or less apparent from birth.

Of the first class, he says that the majority of the examples of so-called "idiopathic dilatation of the colon" occurring in elderly subjects appear to be examples of simple dilatation of the bowel above an imperfect but definite obstruction. With regard to the cases of "idiopathic dilatation of the colon" in children, it appears to the author that they have less claim to the title "idiopathic" than the other class of cases.

The evidence obtained from the perusal of these cases very strongly suggests that the great majority of them, at least, depend upon a congenital narrowing of the lower extremity of the large intestine. The case reported by the author exhibited in a marked degree the features of "idiopathic dilatation of the colon," as shown by an enormous distention of the abdomen, the obstinate constipation, the hypertrophy of the lower part of the colon, and the practical failure of all purgative measures. The case indeed may be taken as a quite typical example of trouble described under this questionable title. Operation, removing the whole of the bowel below the transverse colon, relieved the symptoms, the child making an easy recovery. The examination of the bowel, however, made it evident that the distention was not "idiopathic," but was due to congenital narrowing, regular and uniform in degree, of the lower end of the colon. Indeed, the rectum and sigmoid flexure were found to be defective in length and to be represented by a narrow and contracted tube of uniform calibre.

The author cites a number of cases from literature, and says of them: All of these cases have certain very striking features in common. Distention of the colon and obstinate constipation have been noticed practically from birth; the distention has been extreme, and has mainly involved the lower sections of the colon; the wall of the bowel has been greatly hypertrophied. Movements of the hypertrophied coil have been visible through the parietes; relief of the bowel has been effected almost solely by enemata. Certain secondary conditions, such as catarrh and ulceration of the distended gut, with possible tearing of its walls in extreme cases, have been noted. All the cases except one, perhaps, in which an artificial anus was established, appear to have ended fatally. The general circumstances of these cases do not seem to be consistent with the idea of an "idiopathic dilatation of the colon." The very prominent feature in every example of the trouble has been some obstruction in the lower part of the large intestine. The conditions presented are not comparable with those met with in idiopathic dilatation of other parts of the alimentary canal to which attention has been directed.

The author ventures to think that all cases of "idiopathic dilatation of

the colon" in young children are due to congenital defects in the terminal part of the bowel, that there is in these cases an actual mechanical obstruction, and that the dilatation of the bowel is not idiopathic. The marked hypertrophy of the distended gut suggests in the most emphatic way that there is an obstruction to be overcome, and such hypertrophy is quite inconsistent with the conception of "idiopathic" dilatation of the bowel.

The author reports a case in which he first established an artificial anus with considerable relief of the symptoms which were typical of the so-called idiopathic dilatations. There was, however, a distinct, even, and extensive congenital narrowing of the lower extremity of the colon. He finally had recourse to a complete excision of the bowel, including the descending colon, the sigmoid flexure, the rectum, and anus. The transverse colon was brought down and sutured where the rectum had been removed. The child made a perfect recovery and is markedly benefited.

A Case of Complete Removal of a Multilocular Cyst of the Pancreas; Recovery.—An interesting case in which the diagnosis was not made prior to operation by a number of distinguished consultants is reported by MALCOM (*The Lancet*, January 29, 1898). The patient was a married woman, forty-five years of age, who had noticed a swelling in the abdomen about seven months earlier, her attention having been drawn to the part by a slight tenderness. The swelling had grown rapidly since. The growth was readily felt in the left loin by bimanual palpation. It appeared to be from five to six inches in length, and more or less uniformly rounded. Its greatest bulk was below the costal margin, but it was freely movable, and could be pushed with particular ease upward and backward until about three-fourths of it were overlapped by ribs. The percussion note over the upper part of the anterior and outer aspects of the growth was dull; over the lower and inner parts the note was resonant. The percussion note was slightly duller over the ordinary position of the spleen than over the neighboring lung tissues, this impaired resonance being quite separate from the abnormal dulness over the tumor in the abdomen. The right kidney was palpable and appeared to be of normal size and somewhat movable. The tumor had no connection with the pelvis. The examination of the urine had never shown any abnormality. The growth was believed to be renal, at first malignant; but as it did not increase in size, and the patient gained in weight up to the time of consultation, it was concluded that it was a case of hydronephrosis. Three consultants concurred in this diagnosis. It was decided to remove the kidney. The operation showed that the right kidney was normal in shape, size, and consistence, quite smooth on its surface, and slightly more mobile than usual. The tumor was larger than had been supposed, and more irregular in outline. The transverse colon lay in front of it. Above the colon the tumor was covered by peritoneum and connective tissue. The kidney was found immediately behind the cyst, and the lesser sac of the peritoneum was not opened. A very thin-walled and obviously multilocular cyst was exposed, some of the loculi being of a deep venous color, and others almost white. The tumor had more the appearance of one of those rare congenital cystic degenerations of the kidney than anything the author had seen in this part of the abdomen. Its true nature was not discovered until it was all but com-

pletely enucleated, when its attachment to the tail of the pancreas showed its true nature. Very free hemorrhage occurred after the stump, which had been transfixed and ligated, was returned into the depths of the wound. Traction on the stump stopped the bleeding, and it was with great difficulty that the bleeding point was detected.

Twenty-two Consecutive Arthrotomies of the Knee.—O'CONOR (*The Medical Press*, January 26, 1898) reports a series of cases of arthrotomy for both acute and chronic conditions of the knee-joint, which he has treated within the past two years without any particular selective process in the choice of the cases.

"The rheumatic patients were operated on because the function of their joints seemed doomed, and in one case the treatment was undertaken as a forlorn hope to save the patient's life.

"No apology is necessary for the drainage of gonorrhœal knee-joints, as all expectant plans have proved utterly futile; neither does the removal of blood and clots need any qualifying remark further than that it is a surgical obligation. As to traumatic 'water on the knee,' in my opinion, no method of treatment has a brighter future before it than arthrotomy and drainage.

"All the joints were irrigated during operation with mercuric lotion, and in five cases it was repeated daily. Drainage was continued in each instance until the serous discharge had ceased, and nothing but normal synovial fluid was seen trickling from the wound. Splints were only used in six cases, and were early discarded. Active movement was enforced as soon as the gauze drain was dispensed with, and in not a single case was there cause for post-operative anxiety."

All of the cases reported recovered with perfect function, and the author believes that these cases tend to prove the efficiency of surgical treatment in some of the common affections of the knee-joint.

The Relation of Tubercular Disease of the Shoulder-joint and Caries of the Coracoid Process.—WOLFF (*Cent. f. Chirg.*, 1898, No. 6) says that in nine cases of tubercular disease of the shoulder-joint operated upon by Bardenheuer in the past year, three had in addition carious disease of the base of the coracoid process, and that it is this portion of the coracoid that is most frequently affected.

The appearance of the disease in this locality is secondary to the tubercular involvement of the joint itself. The tubercular infection passes from the diseased joint through the glenoid cavity into the neck of the scapula, and thus reaches the base of the coracoid process. If the cavity of the glenoid is infected and the coracoid process, there is undoubted evidence that the neck of the scapula is also involved, and it must, therefore, be included in any radical operation directed toward the removal of the disease.

Surgery of the Kidney.—In his Hunterian Lecture upon this subject, MORRIS (*British Medical Journal*, March 26, April 9 and 16, 1898) emphasizes the facts (1) that the errors and uncertainties in the diagnosis of renal calculus have in many instances been of distinct advantage, because they have led to the exploration of the kidney, and thus in turn to the discovery and

cure of various morbid conditions other than those due to stone. (2) That unsuspected, quiescent, and migratory renal calculi cause very destructive and even fatal consequences, and that we ought to revise our practice with regard to the early treatment of stone in the kidney. (3) That the low mortality of nephrolithotomy and the high mortality of nephrotomy (that is, the operation performed for advanced disorders due to renal calculus) show the advisability of operating at as early stage as possible.

The author places these affections in the very forefront of surgery of the kidney, for the following reasons :

1. They are the most painful and frequent of the surgical diseases of the kidney. Probably no disease, except acute tetanus, is capable of causing worse suffering.

2. Renal calculus, while slowly destroying the kidney, often physically disables its victim by its unrelenting irritation and its unyielding resistance to every form of medical and dietetic treatment.

3. No disease gives rise to such a variety of morbid changes in the kidney as calculus ; and none is more certainly fatal when allowed to progress without surgical interference.

4. Few operations in surgery are so successful as nephrolithotomy, by which a calculus is removed from a kidney not disorganized by the calculus or otherwise. No great operation is followed by a smaller mortality. Nephrolithotomy gives absolute cure, saving the kidney from progressive destruction and the patient from what may prove at any time imminent danger to life.

5. Renal surgery will grow in confidence and favor with the profession and the public as nephrolithotomy anticipates and displaces nephrotomy and nephrectomy.

The conclusions arrived at by the author from his study of the surgical treatment of these affections are :

1. That the aim of surgical treatment of renal calculus should be to extend the application of nephrolithotomy, and thereby restrict the necessity of nephrotomy and nephrectomy.

2. That more frequent than not the failure to find a stone is not in reality a failure of treatment, because there are so many curable morbid conditions which mimic renal calculus and which are discoverable only by exploration.

3. That the theory that a stone in one kidney, whether that kidney is painful or not, reflects or transmits pain to the opposite kidney is quite unproved ; that it is a dangerous theory, calculated to lead to very erroneous practice, and that the surgical principle with regard to exploratory operations should be that with pain, paroxysmal or continuous, on one side only, the kidney on the painful side should be explored.

4. That nephrectomy for calculous conditions is not often called for, and should be done only in exceptional cases. Nephrotomy for calculous pyonephrosis is the proper operation, at any rate as a primary operation, because of the frequency of double calculous disease. Experience has shown that kidneys from which stones weighing 830 grains and 1300 grains have been removed are functionally sufficient to maintain life during the blocking of the ureter or suspended action of the kidney of the opposite side.

5. That nephrectomy whilst the opposite organ is occupied by calculus is

fraught with the greatest danger to life; whereas nephrectomy after the opposite kidney has been freed from stone, will probably be followed by recovery from the operation, and possibly by very good health for many years afterward.

6. That when renal calculus causes reflected or transferred vesical or ovarian pain, the removal of the calculus will be followed by complete cure of the bladder or ovarian symptoms.

7. That in some cases renal calculous conditions are attended by very remarkable nervous symptoms, sometimes with, sometimes without, high temperature, and that information as to the cause of the symptoms is needed.

8. That unsuspected renal calculi are a source of very real danger to their possessors; and when, whether by accident or by systematic examination of the urine, we have cause to suspect the presence of a calculus, we should recommend its immediate removal, regardless of the fact that it is not causing renal or transferred pain.

9. That quiescent calculus is as dangerous to the individual as unsuspected calculus, and ought to be removed by operation.

10. That the hitherto accepted teaching that a renal calculus, if causing only mild symptoms, or attacks of colic of only recent occurrence, should be treated on the expectant plan, ought to be discarded as unsound in theory and dangerous in practice.

11. That the same principle should be applied to renal calculus which has long been the rule in regard to vesical calculus, namely, when suspected it should be searched for, when known to exist, removed, without waiting in the hope that it may become encysted or spontaneously expelled.

12. That the very low mortality of nephrolithotomy puts this operation upon the same footing for renal calculus as lithotomy in the most experienced hands for vesical calculus.

In regard to fistulæ occurring after the operation upon a kidney the seat of pyonephrosis or a fistula which has formed by the spontaneous opening of such an abscess, the author says: The closure by surgical treatment is tedious and sometimes impossible; and in some cases, after having been successfully treated and remaining closed for many months or a year or two, it will reopen.

Those which do not communicate with the kidney or ureter should be treated on the ordinary principles applicable to all fistulæ; those which do so communicate must be dealt with differently in different cases. If there is a calculus in the kidney it must be removed; if the kidney is quite disorganized, nephrectomy is requisite; the fistulous tract should be cut out and the cut surfaces united by sutures. When no stone is found in the kidney the ureter will probably be the seat of some kind of obstruction.

The two objections generally raised to early operation for renal calculus are: (1) That the calculi will be missed if sought for very early, because of their small size; (2) that very small calculi, if they once enter the ureter, pass through the urinary passages without risk to life. The author holds that both of these are unsound and lead to dangerous delay.

The author's cases show that very minute calculi are readily found. They are capable of producing the complete destruction of the kidney, or may become the immediate cause of death from suppression of urine.

One of the gravest dangers from minute calculi is the production of calcu-

lous anuria, which is one of the most fatal complications of renal lithiasis. The operations for this form of renal disease are, even now, not performed sufficiently early or often, and the symptoms of the disease seem to be imperfectly known or not fully appreciated.

Calculus anuria occurs when the ureter or renal pelvis of the kidney is occluded by a calculus, the other kidney being absent, or atrophied, or diseased. It often affects persons in robust health, and may be sudden and complete in its onset. It is then due to the cessation of function of a kidney which has undergone compensatory hypertrophy, and which up to the moment of obstruction has been secreting the whole or chief part of the urine. Occlusion of one ureter never gives rise to fatal anuria if the opposite kidney and ureter are normal.

The occurrence of former attacks of renal colic in a gouty person, followed by the sudden onset of pain on one side, and this accompanied or immediately followed by anuria, point at once to obstruction of a calculous nature. The diagnosis will be further strengthened if a swelling or distinct tenderness on pressure is present in the renal region or in the course of the ureter of the side recently become the seat of pain. If there is no clear previous history the diagnosis is more difficult.

In making a diagnosis the course of the ureter should be palpated where possible through the abdominal parietes; the ureter frequently remains inflamed and painful after the passage of a calculus. Rectal and vaginal examinations may yield more serviceable results. Catheterization of the ureters is of little value in assisting the diagnosis in these cases.

In the treatment nephrotomy should be performed in the gravest cases, to prevent death from uræmia; in the slighter and intermittent cases, to extract the stone which at any time may produce complete persistent anuria.

An operation ought to be performed as soon as the anuria is established and the diagnosis is satisfactorily made. The operation is serious because of the urinary suppression produced by the obstruction, the poisoned condition of the blood produced by the suppression, and the structural changes in the kidney.

OPHTHALMOLOGY.

UNDER THE CHARGE OF

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Ocular Palsies Through Metastatic Carcinoma.—ELSCHNIG (Vienna) reports two cases, the palsy being in one due to metastatic tumors in the muscles, and in the other to metastatic involvement of the cavernous sinus.

The first was a case of uterine carcinoma, with involvement of lymphatics, skin, and right breast. In the left orbit all the muscles except the inferior oblique presented metastatic tumors close to their origin, which on microscopic examination proved to be carcinomatous. The nerve fibres passing through them were found atrophied. There had been protrusion of the eyeball, almost complete immobility, and anæsthesia of the cornea with neuro-paralytic keratitis. The pupil, however, had remained unaffected.

The second patient had paralysis of all the ocular muscles, with normal acuteness of vision and normal fundus, and no exophthalmos. He suffered from carcinoma of the thyroid, which perforated the right jugular vein, causing thrombosis of the right pulmonary vein and metastasis in the left cavernous sinus.

Cases of metastatic tumor in the muscles have been reported by Horner, where the paralysis was due to neoplasm at the base of the skull; and by Meigs and de Schweinitz, where metastatic carcinoma of the brain extended along the nerves into the orbit. But paralysis of the ocular muscles due to this cause is excessively rare.—*Wiener klin. Wochenschrift*, 1898, No. 5.

Coloboma of the Iris.—ANGUS MCGILLIVRAY (Dundee) reports a case of upward coloboma of the iris, with subluxation of the lens downward in the right eye, the left having been lost by inflammation in earlier life. The dislocated lens was opaque, and its extraction restored full vision.

Cases of upward coloboma are extremely rare; the usual position being that of the foetal cleft downward or a little inward. Cases like this can be scarcely explained by deficient closure of the cleft, such complete transposition of it, not occurring. Nor is incomplete coloboma thus explained, or by delayed separation of the crystalline lens from the cornea. Impaired development of a part of the ciliary ridge is thought to explain the coloboma and defect in the zonule in this case, as well as in such anomalous forms as "keyhole" and "bridge" coloboma.—*Ophthalmic Review*, January, 1898.

Operative Treatment of Glaucoma.—DR. STÖLTING (Hanover), experimenting on the eyes of rabbits, produced great increase of tension by ligation of the vorticosæ veins. This increase of tension commenced at the completion of the ligation, increased until within a few hours the eyeball was excessively hard. The iris was pushed forward usually in contact with the cornea; the pupil partly dilated and immobile, and the aqueous became discolored with blood, and later considerable hemorrhage occurred in the eye. Microscopic examination of the eyes so treated showed marked thickening, infiltration, and softening of the limbus. In one case, at the end of twelve hours the eye was found ruptured just outside of the limbus, the lens having escaped and the globe being filled with coagula.

Stöltzing believes that this eye was ruptured by a blow, but has noted that rupture is apt to occur in this situation with abscess of the globe caused by infection. The central portion of the cornea and other parts of the sclera showed but little or no infiltration. He believes that it is the relief of this zone of infiltration at the limbus which gives value to such operations as iridectomy and anterior sclerotomy. Even Hancock's operation, called division of the ciliary body, opens this infiltration-ring, and so may be bene-

ficial. Posterior sclerotomy, on the other hand, can only relieve the space between the choroid and the sclera, leaving the anterior filtration channels unopened.—*Transactions Heidelberg Ophthal. Congress, 1897.*

[The especial liability of the limbus to infiltration, if confirmed by other observations, together with the fact that the whole of this infiltration circle can communicate with and so drain through an opening made into one part of it, through the spaces known as the canal of Schlemm, offers the best explanation yet suggested of the curative power of iridectomy and other allied operations.

The fact that after organization of an exudate drainage would have little influence in removing it will also serve to explain the comparative inefficiency of operative treatment in chronic glaucoma.—J.]

The Mechanism of Eye-movements.—C. WEILAND (Philadelphia) urges that the common assumption of any complete antagonism of one ocular muscle to another, the internus to the externus, the superior to the inferior rectus, and the superior to the inferior oblique, is not correct; that the muscles do not act in pairs, each of a pair tending to rotate the eyeball in opposite directions about the same axis; but that each individual muscle tends to rotate the eyeball about an axis peculiar to itself, and therefore no one muscle can perfectly antagonize another, and no two muscles acting harmoniously can alone direct the two eyes toward a particular point. In all or almost all eye-movements, all of the muscles participate in varying degree. The weakness of one muscle can often be compensated by increased action of others.

Weiland makes some very interesting and instructive calculations regarding the shares which the different muscles take in the causation of certain movements of the eyes, and he urges that the assumed simplicity of the ocular movements is incorrect and misleading. His calculations are based on the determinations of the muscular attachments made by Volkmann.—*Archives of Ophthal.*, 1898, No. 1.

[Weiland's paper, although quite technical, is an important one. The simple working out of the numerical values of the traction exerted by each of the several muscles in causing a certain movement of the eye emphasizes, as nothing else can, the extremely complex nature of the common ocular movements. To some extent it is a *reductio ad absurdum* of the anatomical method of studying eye-movements and their disorders. Anatomical conceptions regarding these movements have value, but it becomes very evident that they must be supplemented by a better understanding of such movements from the side of their physiological relations.—J.]

Operation for Ptosis.—W. H. WILDER (Chicago), for complete paralytic ptosis, employs the following operation: An incision one inch and a half or more in length is placed where the scar will be concealed by the eyebrow. The lower lip of this incision is drawn down and the skin and muscle carefully dissected from the fascia down to the tarsus. Two sutures of fine sterilized catgut or silk, armed at each end with a curved needle, are then passed in the following manner:

The first needle is introduced deep enough into the tarsus to secure a firm

hold at a point about at the junction of the outer and middle third and a little distance from its convex edge. It is then drawn through, and with it several gathering stitches are taken in the tarso-orbital fascia, after which the needle is made to pass through the muscle and connective tissue of the upper lip of the wound. The other needle on the same suture follows a parallel course in the same manner, entering the tarsus about three millimetres from the point of entrance of the first, then gathering the fascia into small folds and emerging in the tissue above, thus making a loop by which the lid may be drawn up.

The second suture is passed in the same way, making a loop at the junction of the middle and inner third of the tarsus. The requisite elevation of the lid may be now secured by drawing on the loops and tying the sutures, which are to be buried in the wound.

The lower lip of the wound is now united to the upper with fine sutures. The slight scar that remains after healing is almost entirely hidden when the eyebrows grow again. The buried sutures become encapsulated and give additional strength to the folds of fascia that hold up the lid.—*Annals of Ophthalm.*, 1898, No. 1.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

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Inspection of the Posterior Wall of the Larynx.—Various devices have been employed from time to time in order to expose the posterior wall of the larynx to inspection, the foreshortening of its image in the ordinary method of laryngoscopy often preventing due appreciation of existing lesions.

The latest device is by DR. MERMOD, of Iverdon (*Annales des Maladies de l'Oreille, du Larynx, etc.*, 1898, No. 2). This consists in the use of a second mirror, which is placed within the cavity of the larynx, and which he appropriately calls a laryngendoscope. Its reflecting surface is directed toward the reflecting surface of the ordinary mirror. A small, heart-shaped mirror, movable upon its shank and controlled by a screw, is attached to the extremity of a laryngeal handle of the ordinary curve.

The illumination must be good in these cases, because the image has to be reflected from one mirror upon the other.

Transmission of Diphtheritic and Scarlatinic Sore-throat.—DR. FRANCIS T. BOND has had his attention called (*British Medical Journal*, 1898, No. 1831), by a very intelligent mistress of a board school in his district, to a practice which obtains, in infant schools especially, and which he thinks is accountable for a good deal of obscure communication of the disease. It is

that of children licking their slates for the purpose of cleaning them, and he states that a more effective way of diffusing the infection could hardly be designed.

Pharyngitis Herpetica Associated with Menstruation.—DR. LEWIS S. SOMERS reports (*Philadelphia Medical Journal*, February, 1898) a case of this character in which the entire mucous membrane of the buccal cavity and the pharynx was inflamed, the ulcers being extremely painful, while the nasal passages did not show any evidence of the disease. The case was treated successfully merely on hygienic principles, boric acid and honey being used locally.

"The Physiological Relations Between the Nose and the Sexual Apparatus of Man and Woman Also.—DR. JOHN NOLAND MACKENZIE, Baltimore, elaborates (*Johns Hopkins Hospital Bulletin*, 1898, No. 82) his essay published in THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, April, 1884, in a paper before the British Medical Association at its last meeting in Montreal; and reference is made to a number of articles which have appeared since his own. The essay presents attractions for the curious as well as for the studious."

The Relationship of Nasal Diseases to Insanity is elaborated by DR. C. ZIEM in the *Monatsschrift für Ohrenheilkunde*, 1897, Nos. 11 and 12, and consists largely of the subject as manifested in his own person, with a summary of observations of others, and general remarks, historical, physiological, and pathological.

Congenital Occlusion of the Posterior Nares.—DR. J. PAYSON CLARK reports (*Boston Medical and Surgical Journal*, February 24, 1898) a case of complete congenital occlusion of the posterior nares, and gives a summary of Hubbell's collation of seventeen cases in 1886, to which he adds three additional. His own patient was a girl aged eighteen years, with an osseous occlusion, a portion of which was removed with the trephine. An illustration is given of the microscopic appearance of the thickest portion of the bone removed with the trephine.

The Asch Operation for Deviations of the Cartilaginous Nasal Septum.—DR. EMIL MAYER, of New York, reports (*Medical Record*, February 5, 1898) the result of two hundred instances of this operation, which he describes in detail, with illustrations of the instruments used. It will be remembered that this operation essentially consists in cross excision through the septum, and then in turning the four flaps thus made down upon themselves in the more capacious passage, taking care to break the cartilage so as to destroy its resiliency and keeping the weakened septum in the middle line by the agency of a perforated plug in the narrow passage. Of the one hundred and twenty-two patients operated upon in the New York Eye and Ear Infirmary, and tabulated, all are reported cured. The same is to be inferred of the seventy-eight cases operated at the Manhattan Eye and Ear Hospital which are untabulated.

[This operation of Asch is certainly the most successful with which the compiler is acquainted, and the section of the cartilage may be performed with the knife in the absence of the specially devised cutting scissor-pliers. An unfortunate sequel which has occasionally occurred in the compiler's practice is not to be ignored, and this is the sloughing of one of the flaps forcibly turned down, presumably from disturbance in its nutrition. This will leave a permanent perforation of the septum. It occurs but rarely, but the possibility of its occurrence must be duly weighed by the operator.]

OBSTETRICS.

UNDER THE CHARGE OF

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Vitelline Placenta in the Human Subject.—In the *Scottish Medical and Surgical Journal*, May, 1898, BALLANTYNE concludes an interesting paper on this subject with the statement that in the symphytial fœtus it is common to find the absence of the allantois and parts derived from it. The placenta is developed from vitelline vessels with the umbilical cord. The fœtal part of the placenta has been supplied with vessels from the vitelline circulation.

The Bacterium Coli Commune as a Cause of Puerperal Fever.—In the *Archiv f. Gynäkologie*, 1898, Band lv. Heft 2, SCHENK reports two cases in which the bacterium coli commune was isolated, and by inoculation proved to be the cause of puerperal septic infection. The first case was that of a multipara on whom a midwife had produced an abortion. This patient died of sepsis. An examination showed streptococci and the bacterium coli commune to be present in the peritoneum of the patient. The second case recovered, but this germ was found in the cervix, and animals inoculated with it became septic. This germ alone is sufficient to cause sepsis, but is especially deadly when combined with streptococci. It usually finds its way into the vagina from the rectum, and hence any method of conducting labor which requires the introduction of the finger into the rectum is not advantageous.

Management of Normal Labor.—In the *Scottish Medical and Surgical Journal*, May 1898, JARDINE, in a paper on this subject, gives the following hints of practical value: As an aid to cleanliness, he would have a canvas lining for the obstetric bag, which could be removed and washed. He uses a long curved glass douche-tube, grooved for the purpose. He is careful to cleanse his hands before palpating the abdomen. Lysol is his favorite antiseptic. In supporting the perineum he pushes the whole structure forward with the extended hand. If the placenta is not removed in one half hour he introduces

the hand and takes it away. He examines the perineum immediately after birth, and sews it at once if it is torn. He considers a pulse over 100 as threatening bleeding. If a primipara has after-pains, something has been left in the uterus. He relies especially on the pulse as an indication of a good convalescence. He allows the patient to get on her hands and knees to micturate as early as possible.

A Case of Tetany in Pregnancy Following the Removal of Goitre.—In the *Archiv f. Gynäkologie*, 1898, Band lv. Heft 2, MEINERT reports the case of a multipara who developed tetany after the removal of goitre. The case became so severe that it was necessary to interrupt pregnancy, after which the patient made a slow recovery. Interesting trophic lesions accompanied the disease.

The Value of Alcohol as a Disinfectant.—In the *Centralblatt f. Gynäkologie*, 1898, No. 18, GOENNER reports the results of experiments to determine the practical value of alcohol as an antiseptic and disinfectant. His experiments were made by cleaning the hands in various ways, and then removing with an ivory nail-cleaner material from beneath the nail, and infecting animals with this material. His experiments showed very plainly that alcohol is much inferior to bichloride of mercury as an antiseptic, and is able to destroy the less virulent bacteria. Streptococci and other active germs and also spores of bacteria are not affected. He advises the use of alcohol in connection with thorough washing in soap and hot water and brushing in bichloride of mercury solution.

Ectopic Gestation and Eclampsia.—In the *Centralblatt f. Gynäkologie*, 1898, No. 18, a case is cited reported in a Norwegian journal by HOLST. The patient was a primipara, and the abdominal tumor was as large as a seven-months' pregnancy. Eclamptic convulsions were subdued by injections of morphia. It was, however, impossible to induce labor by the usual means. After two days' illness the convulsions passed away, and the patient became conscious and felt the movements of the child. She recovered and went about as usual. A month afterward foetal movements ceased and the tumor was smaller. Five months after the eclamptic outbreak a fistula formed in the vagina and another near the umbilicus, through which foetal bones were expelled. A fistula connected with the bowel, but finally closed, and nine months after her illness the patient entirely recovered.

A Second Cæsarean Section for Highly Contracted Pelvis.—In the *Centralblatt f. Gynäkologie*, 1898, No. 19, BRAUN-FERNWALD reports the case of a patient with highly contracted pelvis on whom he had performed a cœlio-hysterotomy some years previous. The patient returned a few months pregnant, and at her desire, and because the pelvis was highly contracted, the pregnancy was terminated. She afterward returned pregnant near term, and it was decided to operate by cœlio-hysterectomy.

The wall of the abdomen and of the uterus was excessively thin. The silk stitches of the first operation remained, although no scar was present. The incision was made across the fundus and the child easily removed. It died

on the following day from weakness. The broad ligaments were ligated, the cervical arteries tied, the uterus amputated, and the stump stitched over. Two strands of iodoform gauze were passed down to the stump for drainage. The patient made a good recovery and the result of the operation was very satisfactory.

[We do not find it necessary to employ drainage in these cases, as under ordinary circumstances the patient is not septic and recovers promptly without a drain.—ED.]

Facial Paralysis in the Child Following its Spontaneous Birth.—At a recent meeting of the Obstetrical Society of Vienna (*Centralblatt f. Gynäkologie*, 1898, No. 19), SCHUTZE reported the case of a child born in spontaneous labor who had facial paralysis, which was found upon autopsy to depend upon hemorrhage at the base of the cranium and pressure on the cortex. A depression was found on the left parietal bone, and the scalp showed the effects of severe pressure.

Incomplete Rupture of the Uterus in Placenta Prævia.—At a meeting of the Obstetrical Society of Vienna SCHUTZE also reported (*Centralblatt f. Gynäkologie*, 1898, No. 19) a case of placenta prævia in which it was necessary to immediately make version to stop a severe and prolonged bleeding. The os and cervix would admit but three fingers, but the cervix was very soft and the version was readily made. A half hour afterward the child was easily born. Very severe hemorrhage followed the expulsion of the child and placenta which could not be checked sufficiently early to rescue the patient.

On examination, an incomplete rupture of the uterus was found, and also a partial separation of the pubic joint and increased mobility of the left sacroiliac joint. The tear in the uterus began at the cervix.

In discussion it was brought out that special danger exists in placenta prævia of uterine rupture, because the cervix and lower uterine segment are always very greatly softened.

Posterior Positions of the Occiput and Presentation of the Parietal Bone.—In the *Monatschrift f. Geburtshülfe und Gynäkologie*, 1898, Band vii. Heft 5, MUELLER concludes an extensive paper on this subject as follows: He distinguishes three posterior positions of the occiput, right, left, and sacral. The two former in most cases end in spontaneous rotation to the front. Occasionally some other presentation develops. It is possible for birth to occur by the forehead pivoting under the pubes and the occiput being forced out over the perineum. It is important to recognize the difference between a presentation of the parietal bone and a posterior rotation of the occiput. Sacral rotation of the occiput is rare. Labor is prolonged in these cases, and laceration of the pelvic floor is inevitable. It is possible, however, in most cases to deliver the patient with forceps, although mother and child will undergo severe pressure during labor. Fortunately over 96 per cent. of all cases terminate in spontaneous anterior rotation.

Pregnancy in Fibroid Uterus, with Double Uterus in Addition.—In the last report of the Rotunda Hospital, *Dublin Journal of Medical Sciences*, May,

1898, is found a description of an interesting case of pregnancy in fibroid uterus. Abdominal section was performed and a living child delivered. Clamps were placed on the broad ligaments and the cervix was removed through the vagina. Amputation of the fibroid uterus was first performed.

A large mass of tissue was found outside the clamp on the left side. It was drawn down, another clamp placed outside, and this was removed, when it was found to be a second uterus. The patient made a good recovery.

Dangers and Treatment of Dry Labor.—BRODHEAD, *Medical Record*, May 14, 1898, describes well the dangers to mother and child arising from pressure in dry labor. He urges early interference, so soon as disturbances of the foetal pulse occur. He has found, to bring on labor, the following treatment useful: A large dose of castor oil and glycerin, followed shortly by 10 grs. of sulphate of quinine repeated every three hours with $\frac{1}{30}$ gr. of sulphate of strychnine every two hours, careful watch being kept for unpleasant effects. He calls attention to the value of lysol as an antiseptic in these cases.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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Recent Work on the Toxin and Antitoxin of Tetanus.—F. BLUMENTHAL (*Zeitschr. f. klin. Med.*, 1897, Bd. xxxii.), by inoculating animals with the spinal cord and organs of four cases of fatal tetanus, produced tetanic symptoms and death. As the result of his experiments he concludes that two substances capable of producing tetanic convulsions are present in the organs of individuals dying of tetanus. One of these corresponds in its action to the filtrate of bouillon cultures of the tetanus bacillus (tetano-toxin); the other, which he calls the "organ" poison, he believes to be formed by a union between the tetano-toxin and the protoplasm of the tissue cells. The tetanus antitoxin neutralizes the former, but has little effect on the latter. Thus, if the "organ" poison is present in large amount, the administration of tetanus antitoxin is of little value, because the antitoxin neutralizes only the tetano-toxin.

METCHNIKOFF (*Annales de l'Institut Pasteur*, November, 1897, "Recherches sur l'Influence de l'Organisme sur les Toxines") considers the laws which regulate the production of antitoxins. He arrives at the following conclusions: (1) The animal organism only is able to produce antitoxins. Lower forms of vegetable life, such as bacteria and yeasts, may destroy toxins or transform the infectious organisms into vaccines, but never cause the formation of antitoxins. (2) Invertebrates cannot produce antitoxin, as is shown

by experiments on arthropodes (scorpion and larves de *Oryctes nasicornis*), which when inoculated with tetanus toxin and left at a temperature of 32° C. produced no appreciable amount of antitoxin during a period of six months, though in the case of the scorpions the toxin appeared in the blood and was found to be stored in the liver in considerable quantity. (3) The production of antitoxin in vertebrates begins in the crocodile, in which animal this power is more marked than in mammals. Of cold-blooded animals the carp and the frog, if kept at a low temperature, will resist large quantities of tetanus toxin, but the toxin remains stored up in the blood for months without losing its power to produce tetanus if injected into guinea-pigs. If, however, the temperature of the animals is raised to 30° C., fatal tetanus occurs in the case of the frog, carp, or axolotl. Young alligators at 30° C. resist a dose of toxin sufficient to kill 6000 mice, and after two months their blood is decidedly antitoxic. In older animals the antitoxic power appears sooner than in younger animals—*e. g.*, the blood of an alligator weighing 4900 grammes, injected with a dose of toxin sufficient to kill 600,000 mice, after eight days showed itself to be antitoxic in a dose of 0.005 c.c. If kept at a temperature of 20° C. the alligator does not produce antitoxin. (4) In the study of warm-blooded animals he found that in the fowl antitoxic power was produced without any rise of temperature, but with marked leucocytosis. This would indicate that the production of antitoxin is not necessarily associated with febrile reaction. (5) Experiments with the blood and various organs show that, in the fowl at least, the antitoxin is stored up in the blood only, and, with the exception of the genital glands, is not localized in the organs. The antitoxic power of the genital glands is greater than that of the blood. Pericardial and peritoneal exudates of guinea-pigs are strongly antitoxic, showing that most of the antitoxin is in the fluids of the body. (6) The experiments with the lower forms of animal life (where no antitoxin is produced) make it impossible to accept the idea that immunity depends on a natural antitoxic power. (7) The evolution of the antitoxic power in the animal kingdom is more recent than the property of phagocytosis.

WASSERMAN and TAKAKI (*Berl. klin. Wochenschr.*, 1898, No. 1, "Ueber Tetanusantoxinische des normalen Centralnervensystems"), as the result of experiments, consider that the brain and cord of the guinea-pig have always an antitoxin action to the tetanus toxin which other organs of this animal do not have. They made an emulsion of the brain and cord in physiological salt solution, and added an amount of tetanus toxin several times the fatal dose. This mixture inoculated into animals produced no tetanic symptoms. Liver, spleen, kidney, bone-marrow, and blood-serum of the guinea-pig treated in the same manner did not have the same antitoxic power. The antitoxic power of the brain was always more marked than that of the cord. The fluid of the ventricles did not have this power. The central nervous system of the dove, horse, dog, and man was also found to have an antitoxic action.

A. MARIE (*Annales de l'Institut Pasteur*, "Sur les Propriétés Antitétaniques des Centres Nerveux de l'Animal Sain") reports some work along the line suggested by Wasserman and Takaki. He found the cord to be more antitoxic in its action than the brain, and that portions of the central ganglia were less active than the cortex. He does not believe that the normal nerve centres

are antitoxic in the true sense of that word, but that their action is due to an intimate union between the toxin and the emulsified brain which renders the toxin inert. To prove this theory he inoculated the toxin and the cerebral emulsion separately—for example, the toxin in the fore-paw and the emulsion in the hind. In all cases the animals died of typical tetanus. If, however, the toxin and the emulsion were inoculated together the animal recovered. This he considers to indicate that the brain emulsion acts by direct contact, for if its action is antitoxic in the true sense of the word, it would become diffused, as does the antitoxic serum, and counteract the toxin even when inoculated separately.

METCHNIKOFF (*Annales de l'Institut Pasteur*, "Sur l'Influence de l'Organisme sur les Toxines," deuxième mémoire) confirms the experiments of Wasserman and Takaki, that an emulsion of the brain of a guinea-pig in salt solution mixed with tetanus toxin produced no results on inoculation. The brain of the turtle and of the fowl have but a slight action, merely retarding the appearance of symptoms and making the progress of the disease more chronic. The cord has no action. These animals are but slightly sensitive to tetanus, while the guinea-pig is exceedingly sensitive. From these facts he concludes, therefore, that animals exceedingly sensitive to tetanus have an antitoxic power in a high degree, while animals refractory to tetanus have little or none. The brain of frogs, however, which are extremely sensitive to tetanus, has absolutely no antitoxic power, even when the animal is kept at a temperature of 37° C., a fact which leads him to consider this property to be limited to mammals. In studying the comparative antitoxic power of the blood and of the central nervous system he found the blood much superior to the brain. On removing a portion of the cerebral hemisphere the antitoxic power of the blood was doubled in a few days. After seventeen days, however, the power of the blood and brain was equal. Of all the other internal organs—liver, spleen, kidney, muscles, bone-marrow, and ovaries—the latter had the greatest antitoxic power. These results do not indicate that the nervous system is the source of antitoxin production.

For the purpose of comparing the antitoxic power of the liquids of the body with that of the organs, he produced, by the inoculation of 10 c.c. of physiological salt solution into the peritoneal cavity, a peritoneal exudation. This exudation, which contained 118,000 leucocytes per c.mm., had an antitoxic power twice that of the normal blood. The pericardial exudation had an antitoxic action less than that of either the blood or the peritoneal exudation. The brain and cord had an antitoxic power one-tenth that of the blood or peritoneal exudation. The internal organs—liver, spleen, kidneys, suprarenal capsules, and bone-marrow—had an action more marked than that of the brain and cord, but less than that of the liquids. Of the organs, the kidney had the strongest action, and the spleen and bone-marrow the least. From these observations he concludes that the central nervous system is not the seat of production or the point of accumulation of the antitoxin. He does not accept the conclusion of Wasserman and Takaki, that the protective action of the normal nerve centres of the guinea-pig is due to an antitoxic action. He refers to the work of Marie, but does not agree with his theory that the toxin is destroyed by the direct action of the cerebral mixture. For if this were the case, tetanus could be as easily cured in the

guinea-pig as in the mouse; but it is not. He considers the essential thing to be an increased production of leucocytes by the organism itself, as a result of the inoculation of the toxin and brain mixture. This theory he illustrates by injecting into the anterior chamber of the eye of a rabbit some tetanus toxin which produces little or no reaction. If, however, with the toxin he inoculates a portion of the cerebral tissue an intense inflammation is produced which leads to hypopyon. This reaction is much more marked than that produced by cerebral tissue alone. The immunity, therefore, is due to the leucocytosis produced by the injection of this mixture of toxin and brain; for leucocytes have the power not only to destroy bacteria, but also to destroy and alter toxic substances.

BEHRING and RANSOM (*Deutsche med. Wochenschr.*, March 24, 1898, "Ueber Tetanusgift und Tetanus Antitoxin"), as the result of experimentation, find that, when the antitoxin is added to the toxin in sufficient amount exactly to neutralize it, no symptoms are produced in animals inoculated with the mixture. In all cases in which the toxin is in excess the animal dies. An excess of toxin may be so dilute, however, that the animal recovers. It appears, therefore, that the antitoxin renders inert a definite amount of toxin, and that the toxin left over is still active.

An examination of various organs of the animals which succumb shows the toxin to be present in varying amount. The body viscera show the greatest amount, while none is found in the brain.

FERDINAND BLUMENTHAL (*Deutsche med. Wochenschr.*, March 24, 1898, "Ueber die Veränderung des Tetanusgiftes im Thierkörpers und seine Beziehung zum Antitoxin") discusses the finer changes in the nerve-cells resulting from the union with the toxin, and makes the point that these changes are not mechanical but chemical. This theory would explain those cases in which the injection of antitoxin produces no effect, for it can combine only with the toxin circulating freely in the blood and not with that which is already chemically combined with the cells.

F. RANSOM (*Deutsche med. Wochenschr.*, February 24, 1898, "Das Schicksal des Tetanusgiftes nach seiner intestinalen Einverleibung in den Meerschwein-organismus"), as the result of intestinal inoculations of tetanus toxin in guinea-pigs, finds that even in very large doses it produces no effect on an intact gastro-intestinal mucous membrane. It is not absorbed by either stomach or intestine, because neither toxin nor antitoxin appear in the blood. The toxin is finally excreted unchanged with the feces.

METCHNIKOFF (*Annales de l'Institut Pasteur*, April, 1898, "Recherches sur l'Influence de l'Organisme sur les Toxines (troisième mémoire), Toxine Tétanique et Leucocytes") reports further work in support of the theory of the destruction of toxins by leucocytes. He refers to the fact that as every bacterium contains some toxin, a cell taking up this bacterium must have some means of altering the toxin as well as destroying the bacterium. This absorption and destruction of tetanus toxin by leucocytes has been demonstrated by him in the fowl. Injection of toxin into a fowl or guinea-pig is always accompanied by a marked leucocytosis. Still further to strengthen his theory, he inoculated animals intraperitoneally with an emulsion of brain-substance mixed with tetanus toxin. Fluid withdrawn after twenty minutes showed large numbers of macrophages filled with brain-substance, while

practically no brain-substance could be found lying free. As the toxin is known to adhere to the brain-substance it must be assumed that the toxin also is absorbed by the cell. In these cells the toxin probably undergoes some change by digestion, or possibly oxidation, which renders it inert.

ROUX and BORREL (*Annales de l'Institut Pasteur*, April, 1898, "Tétanos Cérébral et Immunité contre le Tétanos"), by direct inoculation of tetanus toxin into brain-substance, produced, instead of the permanent contractures of ordinary tetanus, epileptiform crises, excitation, polyuria, and motor disturbances, forming a group of symptoms with distinct characteristics. By injection into different parts of the brain, different groups of muscles may be affected, an experiment of considerable physiological interest.

Experiments on a large number of animals showed that intracranial injections of antitoxic serum were much more efficacious for ordinary tetanus than subcutaneous injections.

That the brain-cells have not the power of storing up or producing antitoxin was shown by the fact that an immune animal did not react to a subcutaneous inoculation of toxin, but did to an intracranial inoculation. If the brain-cells contained an antitoxin they would have been able to counteract the toxin.

The resistance to tetanus in immune animals is not due to the fact that cells, particularly nerve-cells of the brain, become accustomed to or are insensible to the toxin; but to the fact that the toxin does not reach the brain. The toxin is intercepted and retained by other cells of the body which exercise a protective rôle and probably manufacture antitoxin. These cells are probably phagocytic cells. In all probability immunity against bacteria and against toxins will yet receive similar explanations.

MORAX and ELMASSIAN (*Annales de l'Institut Pasteur*, March 25, 1898, "Action de la Toxine Diphtherique sur les Muqueuses") find that the instillation of pure diphtheria toxin into the normal conjunctival sac of rabbits produces lesions identical with those produced by the diphtheria bacillus. The instillation was kept up for eight or ten hours, and the results appeared in from thirty-six to forty-eight hours. A dilute solution, 1 part of toxin to 4 of normal salt solution, was used. (It is hardly appropriate to speak of the conjunctiva or cornea at the end of the process of instillation as normal. No cultures from the inflamed conjunctiva are mentioned.)

V. BABES (*Berliner klinische Wochenschrift*, January 3, 1898, xxxv., No. 1, on the "Influence of Different Infections on the Nerve-cells of the Spinal Cord"). The nervous symptoms of severe infectious diseases, such as typhoid fever, diphtheria, etc., usually pass off without leaving any noticeable permanent effects. Nerve-cells, however, regenerate very slowly, and it is thought by many that complete restitution never takes place. It has been noted that many nerve-cells of adults after recovery from diseases affecting the nervous system are abnormal. The number of such altered cells could be taken as evidence of whether or not there were any symptoms of nervous disease during life.

In the old are found atrophic cells, homogeneity of the cells, a large quantity of pigment, probably arising from destruction of chromatophilic elements, and lying usually in a preformed substance, which, in the form of small hyaline bodies, is arranged in masses or scattered through the cell-bodies,

even extending into the axial portion of the process. In cells of certain regions (Clarke's column, parts of the anterior horn, certain nuclei of the bulb) is often found a homogeneous mass arising from changes in the cell-substance (œdema or hyaline metamorphosis), and the nucleus is pushed to the periphery. Sometimes there is pigment in the cell. Often the processes are indistinct. One may find in a group of relatively intact cells shrunken colloid or very pale elements with processes lost and nothing left of the nucleus but the nucleolus. The chromatophilic granules are pale or wholly lacking in the periphery of the cell, while they are more numerous around the nucleus. Cells with a large vacuole around the nucleus often occur. Occasionally one finds a cell which lies in a large space containing leucocytes, small epithelioid cells, pigment granules, or even chromatophilic granules or a nucleus extruded from the cell. In young children these changes are not found, with the exception of the heaping up of the chromatophilic elements about the nucleus or in a circumscribed part of the cell. The absence of any of these changes in many cases is to be explained, probably by the greater resistance of the cells, as we know that not only the cells of different individuals but also the cells of different parts of the nervous system of the same individual vary in this power of resisting injury. In animals inoculated with cholera and other infectious diseases and killed some weeks after recovery, more altered cells were found in the anterior horn than in those of non-infected animals. In typhoid fever, pyæmia, septicæmia, and scarlet fever changes were observed in the anterior horn consisting of the proliferation of cells around the vessels, of small hemorrhages, and of the presence of minute micro-organisms in the central canal and around the vessels. These changes had for site of predilection the capillary plexuses around the nerve-cells. The cells themselves showed a rarefaction of the chromatophilic substance which was becoming diffuse and vacuolated, or else a sort of coagulation of this substance, with staining of the nucleus, but not of the nucleolus. Sometimes there was a sort of œdema with vacuoles in the cell. Micro-organisms were found in considerable numbers in the central canal and anterior horns of cases in which there were no nervous symptoms.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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Meat-poisoning: "Botulismus."—Much light has recently been thrown on the subject of meat-, sausage-, and fish-poisoning as a result of careful research growing out of a remarkable set of cases occurring at Ellezelles, in Belgium, reported by PROF. E. VON ERMENGHEM (*Zeitschrift f. Hygiene und Infektionskrankheiten*, xxvi. p. 1). Over twenty members of a musical society

were seized with serious illness after eating the greater part of a raw pickled ham; three died within a week, and ten were in a critical condition. Other parts of the animal from the same pickling tub were eaten in a raw state without ill effects, and pieces of the particular ham had been consumed a short time before, also without results. Only those persons who ate of the ham were taken with the very peculiar train of symptoms recorded. Most of them were seized in from twenty to twenty-four hours, three in less than that time, and a few as late as thirty-six hours after eating. The first symptoms were gastric pain, nausea, and vomiting of undigested food and gelatinous blackish matters. Instead of diarrhœa, which one would expect, there was obstinate constipation in all but two cases, and the first dejections with or without cathartics were black and viscid. In every case in from thirty-six to forty-eight hours there was profound disturbance of vision: amphodiplopia; marked dilatation of the pupils, with absence of reaction to light; ptosis of both lids, and a peculiar fixed stare. There were burning thirst and a strangling sensation in the throat. Swallowing, even of liquids, was difficult or impossible, and every attempt was accompanied by decided choking. The mucous membranes of the mouth, nose, and pharynx were much reddened, and were coated with gray, thick mucous masses, which, accumulating, caused distressing cough and choking. In some instances the saliva was suppressed and the mucous membrane dry and glossy. The voice was weak, and with some there was total aphonia. Dysuria and anuria were common. There was but little disturbance of respiration and circulation; the pulse never reached over ninety, respiration was quiet, temperature normal. Consciousness and general sensibility remained intact throughout, except in the fatal cases, in which alone several hours before death there occurred collapse, dyspnœa, small irregular pulse, light delirium, and coma.

There was obstinate insomnia in many during the first period. The extremities and trunk-muscles showed neither complete paralysis nor atrophy, but there was great general muscular weakness, and slight movements caused extreme fatigue. After two or three weeks the eye symptoms began to improve. The dilated pupils began to contract, the cloudiness to disappear, and the half-paralyzed eyelids to regain their power. Diplopia disappeared only when both eyes were fixed laterally. Paralysis of accommodation lasted a long time after the disappearance of all the other symptoms, and normal vision did not wholly return until after six to eight months.

Autopsy in two cases showed no characteristic changes in the organs, only remarkable hyperæmia of the kidneys, liver, and meninges, and softening and extraordinary friability of the stomach-walls. In one the liver showed marked degeneration, and the brain punctiform hemorrhages. Neither the liver nor kidneys showed anything unusual on bacteriological examination, but the spleen yielded an anaërobic bacillus which proved later to be related to *Botulismus*.

The pig from which the ham came was killed some months previously, and what was not eaten at once was pickled in the usual way. During the time that elapsed between the pickling and this occasion the greater part of the animal had been consumed without causing any sickness, but the ham which, nearly intact, was the last to be eaten, lay on the bottom of the tub, and was the only part that was completely immersed in the weak brine. What

was left of it gave off no odor of putridity, but had a distinct odor like that of rancid butter. That the ham had a bad taste was agreed by nearly all who ate of it. It appeared normal to the eye, but was pale like any meat which has been soaked some time in water. There was no evidence of decomposition, and neither ptomaines nor other poisonous alkaloids were present.

Bacteriological examination proved in different parts the presence of a hitherto unknown spore-bearing bacillus in great abundance, the same organism as that isolated from the spleen of one of the victims. It produces an extraordinary virulent toxin which was isolated by Brieger from cultures supplied by the discoverer, by whom the organism was named *Bacillus botulinus*. The toxin is rendered inert by a temperature of 60° to 70° C., therein agreeing with other bacterial toxins thus far isolated, and differing from the cause of ordinary meat-poisoning from cooked meats.

Attempts to discover the organism in the feces of various animals and in filth of various kinds, and in specimens from where the pig was raised, were negative in results.

Feeding-experiments conducted on various kinds of animals with the meat itself and with aqueous triturations of it added to other foods, produced, as a rule, fatal results with the same train of symptoms as above mentioned. Subcutaneous injections of the watery extract produced the same results as feeding-experiments.

The aqueous extract in a sealed tube kept in the dark retained its strength unimpaired for ten months, and small pieces of the meat kept in cotton-stoppered tubes without any special precautions retained their original virulence even longer. The poison resists the effects of putrefaction, and proved to be equally poisonous after four days' standing mixed with feces, decomposing blood, and urine, and filtration through porcelain. A fresh filtrate, to which were added *B. prodigiosus*, *B. proteus liquefaciens*, *B. fluorescens putridus*, and *B. coli*, was found at the end of a week to be as active as ever.

PROF. BRIEGER and DR. W. KEMPNER (*Deutsche medicinische Wochenschrift*, 1897, No. 33) succeeded in isolating the active poisonous principle from cultures of the *B. botulinus*, and proved it to be closely related chemically to the toxins of diphtheria and tetanus. Next, KEMPNER (*Zeitschrift f. Hygiene und Infektionskrankheiten*, xxvi. p. 481) undertook to examine into the subject of immunity to the toxin, employing bouillon cultures killed by the application of toluol, culture filtrates free from bacteria, and the concentrated and purified poison, the strength of which was accurately determined with guinea-pigs. The first experiments in immunizing guinea-pigs and rabbits proved that with them active immunity cannot be attained even when beginning with the smallest possible dose, as in every case, after a shorter or longer interval, every animal perished. With goats it was found that immunity could be conferred by continued increasing subcutaneous injection, and that the serum of the immunized animal possesses a very high protective power, as is shown by the fact that prevention is accomplished by injection performed thirty hours before the introduction of the poison, and that it is manifested also by direct application in the stomach of cats poisoned by the mouth. It was found also that the antitoxin would cure guinea-pigs when administered twenty-four hours after inoculation with a dose which would be fatal ordinarily in forty-eight, and even when decided clinical signs of poisoning were already present. Later, KEMPNER and DR. E. SCHEPILEWSKY

(*Zeitschrift f. Hygiene und Infektionskrankheiten*, xxvii. p. 213) began a research on the possible affinity of nerve-substance for the botulism toxin which, as shown by clinical symptoms and pathological examination, exhibits a decided tendency to certain points of the central nervous system. The test poison was so standardized that 0.000,005 c.c. represented twice the dose necessary to kill white mice of 15 grammes weight in from two to three days. The brains of freshly killed guinea-pigs were rubbed finely with physiological salt solution in the ratio of 3.3 grammes to 10 c.c., and the cords were treated in a similar manner. Both emulsions were practically neutral in reaction. Pieces of the liver, kidney, spleen, muscles, and marrow were treated in the same way, to be used for comparison. In the first series of experiments, 1 c.c. of the brain or cord emulsion mixed with three to four times the fatal dose of the toxin was injected under the skin of a number of mice, and as controls other mice were injected with the same amount of toxin alone, and others with the toxin mixed with the emulsions of the other organs. The results showed that the brain and cord do possess and exert a decided preventive and curative influence, and that the other organs do not. With mixed injection it was always possible with 1 c.c. of the emulsion to counteract three times the fatal dose, while with four times the dose about half the animals died. With separate but simultaneous injections only about half of the animals would survive twice the fatal dose, the others dying about as quickly as the controls. As a curative agent in cases where the poison had been exhibited six and twelve hours previously, the emulsions did not give such favorable results, for those treated after twelve hours died as soon as the controls, and the others lived but a day longer.

Whatever the protecting substance may be, it was proved that it is in combination with nerve-substance and insoluble in water; its influence is materially altered by high temperatures, but not by keeping several days in ice.

Milk, butter, yolk of egg, and other animal fats were tried in the same way, but no results were obtained, excepting with butter, with which two guinea-pigs were protected, but which failed with other animals. A thin oil emulsion mixed with two and even four times the fatal dose was successful.

Lecithin and cholesterin, substances normally present in nerve-substance, proved to have antitoxic power, which was unimpaired by boiling or heating; but quite large amounts were necessary. Other substances, as cerebrin, nuclein, and bile, proved to be inert, but antipyrin in larger amounts than 0.10 gramme (0.15 to 0.20) proved able to neutralize 0.000,003 c.c. of the toxin. Given in doses of 0.10 gramme, antipyrin had no effect, the animals dying at the same time as the controls; but if the animals had been first treated with antipyrin as a preliminary measure the above dose would act.

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A CONSIDERATION OF THE URINARY DISTANCE AS A DIAG-
NOSTIC FACTOR IN PROSTATIC HYPERTROPHY.¹

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To state that one of the features of prostatic enlargement is an increase in the urethral length is to enunciate a self-evident proposition; yet the matter, simple as it seems, has acquired weight in my eyes in connection with the study of a certain important case in which men in high standing were deceived in their diagnosis by failing to investigate this point.

Mr. X. eighteen months ago came to me from a Western city, referred by a very capable surgeon, who announced in his letter that the case was one of "enormous prostate filling up the entire pelvis."

The patient, a refined gentleman aged sixty-two years, a lawyer by profession, showing fatigue and age in his face, but not cachexia, had been using a catheter for ten years, more or less. His expulsive urinary force was feeble, and a month before seeing me, after a chilling, he had suffered from absolute retention for many days and been obliged to rely entirely upon the catheter.

When he saw me he had regained the power of spontaneous micturition, but the urine was moderately purulent, with a trace of blood; the bladder only held about four ounces, of which two and a half ounces was a residuum requiring the catheter for its evacuation. Naturally the local tenderness was considerable, and the calls to urinate frequent by day and night.

¹ Read before the American Association of Genito-Urinary Surgeons at West Point, June 9, 1898.

I passed a finger into the rectum and found no bulging of the prostate. The organ, on the contrary, seemed unusually flat, but my finger could not define any upper border. A hard, flat, absolutely dense, non-lobulated condition, not hot or throbbing, commenced in the prostate and extended indefinitely upward—entirely beyond the tip of the exploring finger. Here, then, was the “enormous prostate entirely filling up the pelvis.” But why, with such a size, was there no bulging downward of the lateral lobes into the rectum?

I next passed a catheter, and found the urinary distance to be exactly eight inches. I subsequently passed a full-sized steel sound of ordinary curve. It slipped in as if going through a youthful urethra, encountering no resistance, and a finger in the rectum appreciated that the prostatic substance between itself and the sound was quite thin. Bimanual palpation failed to reveal any large pelvic tumor, and finally the ordinary tube of the cystoscope went in without obstruction, was reversed with ease, and disclosed a couple of clover-leaved livid areas extending inward from the vesical neck on either side toward the trigonum, rising centrally outward toward what appeared to be a very small third lobe.

My diagnosis was, therefore, “very small prostate, with moderate third lobe and considerable inflammatory thickening of the trigonum, making it impossible with the finger in the rectum to appreciate the upper limits of the prostate.”

This impossibility to map out the upper limits of the prostatic lobes is so uncommon, except in cases of cancer, for the existence of which I could find no sufficient evidence, that it gave an especial interest to the case.

Before going home, the patient desiring another opinion, I sent him to one of the most competent of the many distinguished general surgeons which New York possesses, and the latter wrote to me that he found a “considerably hypertrophied prostate with probably a middle lobe enlargement.” He suggested orchidectomy, and told me afterward that he considered the prostate to be “very large.”

I may terminate the case by stating that I confirmed my therapeutic suggestions to local means directed against the surface catarrh of the prostate and bladder, together with a course of life to better the general health, and the patient returned to me in ten months much improved in every respect, comfortable in his intervals of emptying the bladder and not getting up at all at night, his urine perfectly clear except the first gush, which contained a few shreds. His urinary distance was still exactly eight inches, but now the finger could easily map out the upper border of the prostate and demonstrate that organ to be unusually flat and small.

In response to a letter a few weeks since, I learn that the conditions to-day are satisfactory. There is still a residuum of two to three ounces, and the catheter is used once a day to perform the vesical toilet, but the general health is excellent, the urinary intervals long, and the patient is effusive in his expressions of gratification at his condition.

The result of this case, I think, carries its own comment. In contemplating the obvious deductions from the data just given, it seemed easy to formulate a rule of action, the normal urethra being consid-

ered, in a general way, to be eight inches long; but before attempting this, I determined to satisfy myself as to the general limits of the healthy urethra by making some personal measurements. These have been carried out during the past three months upon office patients by myself, Dr. Charles Chetwood, my associate, and my son, Dr. E. L. Keyes, Jr. They include twelve prostatics and sixty-two other individuals with various maladies of the urethra not involving an increase in length, and include a few absolutely healthy canals. I have tabulated the results, and have been surprised to note the wide variations that exist—while the normal mean continues to turn out very nearly what we have supposed it to be.

Before considering these measurements taken during life, it is proper to consult a number of special writers and of anatomists who have taken their testimony from the dead and from the living urethra.¹ But when one approaches the subject from this stand-point, he is immediately confronted by a wide divergence of opinion, showing differences much greater than those disclosed by my investigations upon the living subject.

Littre and Ch. Robin² give the urethral length in adults and old men as varying from 13 to 19 centimetres, averaging 16 centimetres or 6.4 inches.

Todd's *Cyclopædia*³ quotes Ducamp as stating that the urethra rarely exceeds 9 inches. Whatley (48 cases) makes the average $8\frac{1}{2}$ inches; Lisfranc (12 cases) 9 to 10 inches—in a negro 12 inches. Petrequin says the estimated length is from $5\frac{1}{2}$ to 12 inches, but his own measurements upon the living subject made it $5\frac{3}{4}$ to $6\frac{1}{2}$ for straight, and $6\frac{1}{4}$ to 7 inches for curved instruments; Briggs (60 cases, living), $6\frac{3}{4}$ to $8\frac{1}{2}$ inches.

Bouilly⁴ quotes Ducamp, Whatley, and Amussat as averaging $22\frac{1}{2}$ centimetres, 9 inches; Meckel and Rougie, 26 centimetres, 10.4 inches; Sabatier, J. Cloquet, and Lisfranc, 30 centimetres, 12 inches; Boyer averages 30 centimetres, 12 inches; while, as more accurate observations taken from the dead subject, he gives: Richet, 15 centimetres, 6 inches; Sappey, 16 centimetres, 6.4 inches; Malgaigne, $15\frac{1}{2}$ centimetres, 6.2 inches.

Bouilly, therefore, agrees with Guyon that accuracy in stating the urethral length is impossible, but that 16 centimetres, 6.4 inches, is about right.

Sappey,⁵ from post-mortem examinations upon 54 normal urethras, puts the average length at 13.3 centimetres, $5\frac{1}{2}$ inches, with a normal increase in age due to normal prostatic and bulbous hypertrophy of

¹ Dr. E. L. Keyes, Jr., has collected the references for me.

² Art. Dict. de Méd., 1873, p. 1622.

³ Todd's *Cyclopædia*, 1849-52, Part II., vol. iv. p. 1244.

⁴ Nouveau. Dict. de Méd. et de Chir. Prat., 1885, vol. xxxvii. p. 124.

⁵ *Traité d'Anatomie Descriptive*, 1879, vol. iv. p. 667 (Guyon).

one centimetre, $\frac{2}{5}$ inch, the maximum noted being 23.3 centimetres, $9\frac{1}{8}$ inches, supposed to be a normal canal.

Malgaigne, according to Guyon, makes the length 15.5 centimetres, $6\frac{1}{2}$ inches. Guyon¹ states that measurements are so variable as to be useless.

Gray,² "its length varies from 8 to 9 inches."

Woolsey,³ "the length of the urethra averages $8\frac{1}{2}$ inches in the dead subject, $7\frac{1}{2}$ to $7\frac{3}{4}$ inches in the living."

Taylor,⁴ "the average length of the urethra is from 7 to $8\frac{1}{2}$ inches, but it may be shorter or longer."

Gould,⁵ "it is from 8 to 9 inches long."

Treves,⁶ "the male urethra is about $8\frac{1}{2}$ inches in length (21 centimetres)."

McClellan,⁷ "the male urethra is 20 centimetres, or about 8 inches, in length."

Ledwich,⁸ "the urethra is divided into three portions: prostatic, membranous, and spongy, the first being $1\frac{1}{4}$ inches, the second from $\frac{1}{4}$ to $\frac{3}{4}$ of an inch; the remainder of the canal, which is from 9 to $10\frac{1}{2}$ inches in length, is formed by the corpus spongiosum urethra," thus making the average $11\frac{1}{2}$ inches, about, as the text reads.

Jamain,⁹ "the length of the canal is from 20 to 27 centimetres," average $23\frac{1}{2}$ centimetres or $9\frac{6}{10}$ inches.

Ellis,¹⁰ "the urethra has an average length of about $8\frac{1}{2}$ inches."

J. William White¹¹ agrees with Gray.

Güterbock¹² quotes Henle in putting the urethral length at $8\frac{2}{10}$ inches.

Curale¹³ thinks that the length of the penis and that of the urethra have no relation to each other. He quotes Phillips in giving the average length as $8\frac{1}{8}$ inches, while he himself¹⁴ makes the average about 6 inches.

Reybard quotes Velpeau, making average $6\frac{1}{2}$ inches.

Leroy d'Etiolles, quoted by Henry Smith,¹⁵ thinks that fat men have relatively longer urethras. He puts the mean length at 8 inches.

Reybard¹⁶ says that the canal is an inch and a half longer on the living than on the dead subject, while Sir Henry Thompson,¹⁷ measuring sixteen dead urethras and finding the average $8\frac{1}{2}$ inches, and quoting Briggs, who found in the living $7\frac{5}{8}$, and whose method he

¹ Leçons Cliniques, 1896, vol. ii. p. 307.

² Anatomy, American edition, 1887, p. 959.

³ Morrow's System of Genito-urinary Diseases and Syphilis, vol. i. p. 31.

⁴ Venereal Diseases, 1895, p. 35.

⁶ Illus. Dict. of Med., 1896, p. 1575.

⁶ Surgical Applied Anatomy, 1895, p. 402.

⁷ Regional Anatomy, 1892, p. 135.

⁸ Human Anatomy, 1852, p. 425.

⁹ Anatomie Descriptive, 1853, p. 581.

¹⁰ Demonstrations of Anatomy, 1861, p. 638.

¹¹ White and Martin. Genito-urinary and Venereal Diseases, p. 47.

¹² Die chirurgischen Krankheiten der Harn und männlichen Geschlechtsorgane, 1890, Bd. i. p. 3.

¹³ Maladies des Org. Genito-urinaires, vol. i. p. 28.

¹⁴ Loc. cit., p. 29.

¹⁵ Stricture of the Urethra, 1857, p. 3.

¹⁶ Canal de l'Urethre, 1855, p. 5.

¹⁷ Stricture of the Urethra, 1858, p. 3.

tested and approved, concludes that the urethra on the cadaver is longer than in the living subject.

In order to accentuate by a bird's-eye view the differences of opinion of these various authorities, I have condensed their views into the following table. To intensify the confusion, it may be noted that Malgaigne as quoted by Bouilly makes the average length $6\frac{2}{10}$ inches, as quoted by Guyon $6\frac{5}{10}$ inches.

	Inches.
Littre and Ch. Robin, average length	$6\frac{4}{10}$
Todd's Cyclopædia	$7\frac{1}{10}$
Ducamp, Whatley, Amussat	9
Meckel and Rougier	$10\frac{4}{10}$
Sabatier, Cloquet, Lisfranc	12
Boyer	12
Richet	6
Malgaigne, quoted by Bouilly	$6\frac{2}{10}$
Bouilly	$6\frac{4}{10}$
Sappey	$5\frac{5}{10}$
Malgaigne, quoted by Guyon	$6\frac{5}{10}$
Gray	$8\frac{5}{10}$
Woolsey	8
Taylor, about	$7\frac{6}{10}$
Gould	$8\frac{5}{10}$
Treves	$8\frac{5}{10}$
McClellan	8
Ledwich	$11\frac{5}{10}$
Jamain	$9\frac{6}{10}$
Ellis	$8\frac{5}{10}$
White	$8\frac{5}{10}$
Henle (Güterbock)	$8\frac{2}{10}$
Sir Henry Thompson	$8\frac{5}{10}$
Phillips	$8\frac{1}{2}$
Curale	6
Velpeau (Reybard)	$6\frac{1}{2}$
Briggs	$7\frac{3}{8}$
Leroy d'Etiolles	8
Average	$8\frac{1}{2}$

Thus it seems that, although there are wide differences of individual opinion as to the urethral length, yet the average comes around to about the conventional estimate of 8 inches or a shade over.

To return to my personal investigations upon the living, I may say that my measurements were made with the subjects standing up. A soft, red-rubber catheter was used, marked in quarter inches, and the point noted at which the urine ceased and again started to flow, while the well-lubricated catheter was being gently pushed in and again drawn out, the bladder being distended with five ounces of fluid.

URINARY DISTANCE—NORMAL URETHRA.

Case.	Name.	Malady.	Age.	Tall: 5 ft. 10 in. + Medium: 5 ft. 6 in. to 5 ft. 10 in. Short: Under 5 ft. 6 in.	Length of penis in inches.	Residual urine.	Urinary distance.
1	F.	Urethritis	27	Short	4¾	.....	6¾
2	B.	After perineal section	27	.....	.....	.....	7
3	R.	Posterior urethritis	32	Short	3¾	.....	7
4	W.	None	29	.....	.....	.....	7¼
5	L.	Prostatitis	52	.....	.....	.....	7½
6	F.	Stricture	44	.....	.....	.....	7½
7	C.	Urethritis	26	Medium	5½	.....	7½
8	R.	Stricture	35	.....	.....	.....	7½
9	T.	Posterior urethritis	27	Short	4¾	.....	7½
10	H.	Locomotor ataxia	34	.....	.....	3ss.	7½
11	F.	Posterior urethritis	26	Medium	4	.....	7½
12	H.	None	26	Tall	5¾	.....	7½
13	W.	Urethritis	21	Short	5	.....	7½
14	R.	Stricture	25	.....	.....	.....	7¾
15	J.	Tubercular cystitis	29	.....	.....	.....	7¾
16	W.	None	29	.....	.....	.....	7¾
17	S.	Stricture	46	.....	.....	.....	7¾
18	E.	Tubercular cystitis	50	.....	.....	.....	7¾
19	N.	Urethritis	25	.....	.....	.....	7¾
20	K.	Urethritis	32	.....	.....	.....	7¾
21	S.	None	33	Medium	6¼	.....	8
22	A.	Urethritis	24	.....	.....	.....	8
23	P.	Prostatic neuralgia	32	Tall	6¾	.....	8
24	H.	Urethritis	35	.....	.....	.....	8
25	E.	Urethritis	26	Short	3½	.....	8
26	H.	Urethritis	32	.....	.....	.....	8
27	B.	Urethritis	30	Medium	5½	.....	8
28	F.	Urethritis	30	.....	.....	.....	8
29	S.	Stricture	30	.....	.....	.....	8
30	L.	Posterior urethritis	34	.....	.....	.....	8
31	F.	Urethritis	29	Short	5½	.....	8
32	S.	Urethritis	24	Tall	6	.....	8
33	H.	Urethritis	22	Medium	5½	.....	8
34	C.	Urethritis	25	Tall	6½	.....	8
35	R.	Urethritis	32	.....	.....	.....	8
36	S.	Urethritis	25	.....	.....	.....	8
37	N.	Urethritis	35	.....	.....	.....	8
38	F.	Urethritis	48	.....	.....	.....	8
39	L.	None	25	.....	.....	.....	8
40	T.	Urethritis	33	Short	5½	.....	8
41	D.	Urethritis	27	.....	.....	.....	8
42	F.	Urethritis	24	Short	5¼	.....	8
43	B.	Tubercular cystitis	36	.....	.....	3ij.	8
44	I.	Posterior urethritis	26	Short	3½	.....	8
45	E.	Prostatic neuralgia	37	Medium	4¾	.....	8
46	F.	Posterior urethritis	24	Short	5½	.....	8
47	A.	Posterior urethritis	32	.....	.....	.....	8¼
48	B.	Urethritis	40	.....	.....	.....	8¼
49	B.	None	32	.....	.....	.....	8¼
50	B.	Tubercular cystitis	36	Medium	4¾	.....	8¼
51	F.	None	55	Medium	6	.....	8½
52	T.	Locomotor ataxia	44	Medium	4	.....	8½
53	K.	None	43	Tall	6	.....	8½
54	W.	Posterior urethritis	24	Tall	6¼	.....	8½
55	S.	Urethritis	24	.....	.....	.....	8½
56	McL.	None	39	.....	.....	.....	8½
57	McM.	Urethritis	39	.....	.....	.....	8½
58	B.	None	50	Short	6½	.....	8¾
59	S.	Posterior urethritis	46	Short	5	.....	8¾
60	G.	None	35	Medium	4¾	.....	8¾
61	S.	Urethritis	23	.....	.....	.....	9
62	W.	None	42	Tall	5¼	.....	9½
Average, about			...	.....	.....	.....	8

At first I paid no attention to the size of the individual or the length of his penis, but as I went on I seemed to recognize irregularities possi-

bly due to one or both of these factors. Therefore, in all the last measurements the size of the individual was taken as well as the length of his penis. This statement explains why the size of the individual and the length of the penis are only noted down in about one-third of the cases. My table on preceding page is arranged according to the urinary distance found.

URINARY DISTANCE IN PROSTATIC ENLARGEMENT.

Case.	Name.	Malady.	Age.	Size.	Length of penis in inches.	Residual urine.	Urinary distance.
1	H.	Small peripheral atony .	72	Tall	2½	Total	7½
2	X.	Third lobe, small prostate	62	.....	.....	3ij.	8
3	H.	Moderate hypertrophy—bar	55	Short	4½	3j.	8
4	J.	Moderate peripheral .	55	Tall	4¾	3viii.	8
5	C.	Moderate peripheral—bar .	64	.....	.....	3vii.	8¼
6	J.	Moderate peripheral—bar .	69	.....	.....	Total	8¼
7	W.	Moderate peripheral .	60	.....	.....	3iiss.	8¼
8	J.	Moderate peripheral .	67	Medium	3¾	3ss.	8¼
9	A.	Moderate peripheral .	62	.....	.....	3ij.	8½
10	W.	Moderate peripheral .	47	Tall	4	3vii.	8¾
11	H.	Moderate peripheral .	62	Medium	4½	3ss.	9
12	C.	Large peripheral .	57	.....	.....	3ii.	9¼
Average, about . .			...	.....	.....	.....	8½

I consider it very remarkable that each of these tables should bring the average so nearly to an identical point, $8\frac{1}{2}$, 8 and $8\frac{1}{8}$ inches, but it only goes to prove that the normal urethra is about eight inches long, and that in prostatic hypertrophy it is longer.

Whether the urethra is longer upon the dead or living subject is unimportant. I have two good authorities who differ diametrically upon this point.

To test the question raised by Civiale as to whether the length of the penis should be considered a factor in estimating the urethral length (Civiale taking the negative), I have arranged tables from measurements of normal urethras, as follows:

LENGTH OF PENIS UNDER 4 INCHES.

No. of cases.	Size of individual.	Urinary distance.
3	Short.	7½

LENGTH OF PENIS 4 INCHES AND UP TO 5.

No. of cases.	Size of individual.	Urinary distance.
2	Short.	7½
5	Medium.	8½
0	Tall.	...

LENGTH OF PENIS 5 INCHES AND UP TO 6.

No. of cases.	Size of individual.	Urinary distance.
6	Small.	8½
3	Medium.	7½
2	Tall.	8½

LENGTH OF PENIS 6 INCHES AND UPWARD.

No. of cases.	Size of individual.	Urinary distance.
1	Short.	8 $\frac{3}{4}$
2	Medium.	8 $\frac{1}{2}$
5	Tall.	8 $\frac{1}{2}$

This set of tables would go to show, although not very brilliantly, that the size of the penis is a factor, and it certainly is so if the penis be long and the man be tall. Case I. among the prostatics would go to show that it is the size of the penis rather than the size of the man that preponderates in the issue, for this gentleman, although six feet one inch tall, and having a small but peripherally enlarged prostate and total retention, yet having a penis two and one-half inches long, showed a urinary distance of only seven and one-half inches.

As to the pretension that the healthy urethra grows slowly in length with advancing age, irrespective of the size of the individual, the following condensation of my measurements goes to show that this is the case :

No. of cases.	Age.	Average length.
14	21 to 25	8 $\frac{1}{8}$
16	26 " 30	7 $\frac{5}{8}$
15	31 " 35	7 $\frac{5}{8}$
17	36 " 45	8 $\frac{1}{2}$

I have arranged these cases so that each group shall hold nearly the same number of individuals, although as to age the first three sets cover five years each, and the last ten, and it may be noted that, although the first set does not fall into line with the theory, yet there is a manifest progression in the remainder of the series.

Upon the foregoing study I think I may venture to base the following conclusions :

1. The urinary distance varies in the adult healthy male from something over six to something under ten inches, but may be honestly averaged at eight inches.

2. The shorter lengths are found in short individuals having a small penis. A large organ naturally contains a long urethra, and this is most certainly the case if the individual be tall.

3. The age of the individual seems to cause a very moderate increase in the urethral length, irrespective of disease, or perhaps even of individual size.

4. In prostatic hypertrophy the urinary distance averages more than eight inches, and is longer in cases of peripheral general hypertrophy than where the enlargement is median, or in cases of bar.

5. In a doubtful case a consideration of the urinary distance may become an important element of diagnosis.

TWO CASES OF ACUTE ASCENDING PARALYSIS,
WITH AUTOPSY.

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IN 1859 the French physician Landry published his paper describing a disease which, until that time, had been confounded with others. His original description of this disease was that it was an acute paralysis beginning in the legs, ascending to the arms, and later involving the muscles supplied from the medulla. This paralysis was unaccompanied by any marked disturbance of sensation, although he stated that, at times, slight paræsthesiæ might be present. The sphincters were usually unaffected. He also stated that the paralyzed muscles retained their excitability to the faradic current, that the mind remained clear, and that fever was slight or absent. Another criterion which he gave was that after death no lesions were to be found in the nervous system, and that the careful microscopic examination of the cord was negative.

Since that time many cases have been reported as examples of this disease, many of which have varied considerably from the original picture as described by Landry.

The two following cases present a picture very closely resembling the original case described by Landry, and are reported together, because in both cases pathological examinations were obtained and made. I am indebted to Dr. Sears for permission to use the clinical notes of the first case, and to Dr. Folsom for those of the second case; also to Dr. Bullard for permission to use notes which he had made. I also wish to express my thanks to Dr. Councilman, who kindly allowed me to examine the material and aided me in the work.

CASE I.—N. G., female, aged thirty-six years; single. She entered the Boston City Hospital on August 29, 1896. She was born in Vermont, and her occupation was that of a housekeeper. One brother died of phthisis. Her mother was said to be very nervous, and died suddenly three years ago of heart disease. The father was alive and well. The patient was never very strong, and lost much time from school. She had diphtheria and scarlatina when a child, and measles and mumps two years ago. Since that time she had been well, until last March, when she began to run down. Two years ago, after the shock of the death of her mother, she had a period of numbness in the right arm, lasting several weeks. This was not accompanied by any loss of strength. Her appetite was good. She denied the use of alcohol and morphine, and drank no tea nor coffee. There was no venereal history. Four

years ago she had an ischio-rectal abscess, resulting in a fistula which remained unhealed.

Present Trouble. In March, 1896, she took a severe cold, and since that time had not felt so strong. She had lost twelve pounds, and felt weak, and was easily tired. She had considerable dyspnoea at times, and complained that "the food was heavy on her stomach" and caused distress. The bowels had been much constipated. The appetite was good. The catamenia were regular and without pain. She had never been subject to headache, but about a year ago her eyes pained her, and she procured glasses, and had no trouble after that. She had been much confined to the house. On August 5th she had an attack of indigestion. She went to bed and took salts and calomel. Toward evening of that day she noticed a weakness in her legs, and that she had difficulty in going up stairs. She went to bed feeling perfectly well, except for this weakness, but on waking in the morning she found that she could not move her legs at all. The legs felt numb and dead, and they were somewhat painful to pressure. The bowels had moved once after the calomel, but not after that (paralysis of the rectum?). There was also retention of urine.

Physical Examination. The patient was bright and intelligent. She was well developed and had good color. The pupils were clear, regular, normal in size, and reacted to light and with accommodation. The external ocular muscles were normal. The tongue was moist, with a white coat, and was protruded in the median line. The pulse was regular, of good strength and volume.

Heart: The area of cardiac dulness was not enlarged, the apex was in the fifth interspace, three and three-quarter inches to the left of the median line. The heart's action was regular. The first sound at the apex was roughened.

Lungs: The resonance and respiration were good throughout. The area of hepatic dulness extended from the sixth rib to the costal border. The area of splenic dulness was not enlarged.

The abdomen was tympanitic, not tender.

There was slight power of flexion of both legs. The toes and feet could be moved slightly; those of the left foot more than the right. The patellar and plantar reflexes were absent. The sensation was nowhere affected. There was considerable tenderness on pressure in the calves of the legs. In the upper extremities the grasp was weak on both sides, the left more so than the right. What muscular power remained in the arms was greater on the right side. The sensation here was normal, as also on the trunk. There was no tenderness in the upper extremities on pressure.

On August 14th a small area of bronchial breathing was noted just above the angle of the scapula and just outside of the median line in the left back. There was no cough and no expectoration. There had been considerable dyspnoea. The temperature had fallen somewhat, but the respirations had increased in number. The bowels moved only by enemata. The urine was passed spontaneously. Since entrance the strength of the right arm had diminished. On this day she could flex and extend the forearm slightly, but could not raise the arm from the bed. The only movement remaining in the left arm was a slight movement of the fingers. There was absolutely no movement possible of the lower extremities. The tenderness upon pressure in the legs had diminished.

The examination of the urine on August 14th showed it reddish in color; specific gravity of 1.018; alkaline in reaction; chlorides diminished; the urea normal in amount; albumin, a trace. Bile pigments and sugar were absent. The sediment showed quantities of triple phosphates, some pus, a little abnormal blood, a few questionable granular casts, and several large round cells.

On August 18th it was noted that the tenderness in the arms and legs upon pressure had returned. The patient could still flex the left arm feebly. Other movements were impossible. There was incontinence of urine.

A second examination of the urine, made upon August 19th, was as follows: Color, light; specific gravity, 1.017; reaction neutral; chlorides diminished; urea normal; a trace of albumin was present; bile pigments and sugar were absent. The sediment consisted chiefly of pus, with a few small round cells, a few triple phosphates, but no casts were found.

On the 19th there was paralysis of respiration. On the 22d it was noted that she had periodical attacks of difficult breathing, when the throat seemed to choke up and suffocation threatened. She had had two severe attacks of this kind, both of which passed off. All the muscles of respiration were noted upon this day as being inactive except the diaphragm. She complained that she could not get into a comfortable position, and she had to be moved continually.

On the 23d it was noted that there was slight movement possible of the left wrist, and that she could flex and extend the fingers of the left hand. The right arm could be slightly abducted, but could not be moved backward or upward. All movements of the right forearm and wrist were possible. There was complete paralysis of all the muscles of the lower extremities, of the abdominal muscles and the muscles of respiration, with the exception of the diaphragm. There was no paralysis of the face, tongue, or pharynx. The sensation everywhere was normal. There was considerable tenderness in the calves and slight tenderness in the thighs upon pressure. The glands in the neck were enlarged. The liver could be felt at the level of the umbilicus and could be seen to move with the movements of the diaphragm. The patient was unable to cough or to make forced expiration.

On August 24th at 8.30 A.M. the patient was found breathing with difficulty, the face was cyanotic, but she had no difficulty in speaking. The nurse reported that at 7 A.M. the patient had seemed as usual. From 8.30 A.M. the dyspnoea increased gradually, the pulse became weaker, and she died at 11.50 A.M.

CHART.

	Temperature.		Pulse.		Respiration.	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
9th,	....	102°	....	95	....	24
10th,	101°	101.5	94	95	23	24
11th,	101	101	90	94	24	20
12th,	99.4	99.8	100	100	24	24
13th,	99.8	100.8	100	100	24	28
14th,	100	98.5	100	90	40	28
15th,	98.4	98.4	96	90	32	28

	Temperature.		Pulse.		Respiration.	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
16th,	98.2°	98.4°	80	72	24	24
17th,	98.4	99	72	70	24	24
18th,	99	98	80	84	24	24
19th,	98	99	80	84	28	26
20th,	98.4	100	100	104	25	26
21st,	98.2	98.8	88	100	24	24
22d,	99.2	100	100	110	36	32
23d,	98.6	98.4	114	112	32	28
24th,	98	.....	140	.....	44	...

Autopsy, August 25, 1896. The body was that of a woman of about forty years of age. Body length 162 cm.; fairly well developed; poorly nourished. Abdomen markedly distended. The feet in the position of extreme dorsal flexion. Fingers sharply and apparently forcibly flexed on the metacarpals. Subcutaneous fat much diminished.

The intestines, particularly the large intestines, were widely distended, containing much gas with considerable feces.

The appendix was 8 cm. long, extending down behind the ileum, the tip overhanging the pelvis; it was free throughout its whole extent.

The heart weighed 220 grammes. The muscle was deep red in color. The valves and cavities were normal.

The left lung was adherent over a small portion of the upper lobe by old adhesions. In the lower lobe of the left lung a large area was apparently completely solidified; on section this was mottled, yellow and deep red; the bronchi in this region were filled with a yellow, purulent material. The right lung was normal except for considerable fluid at the base.

The liver weighed 1020 grammes. It was normal in color, and on section normal in appearance.

The spleen was flabby, of a grayish-red color, on section rather soft, the pulp normal, weight 80 grammes.

The kidneys together weighed 260 grammes. The cortex was much thinned, in parts being from one-third to one-half cm. thick. The whole kidney was deeply injected, the glomeruli standing out as bright red points. The capsule was rather adherent, and some of the cortical substance adhered to it when it was torn off.

On the right side in front of the uterus there was a large, hard, pedunculated tumor. On section this was white and firm. Otherwise the uterus and appendages were normal.

The bladder contained a small amount of thick, yellow, cloudy urine.

The mucous membrane of the bladder was much injected. Scattered over the surface were prominent masses of good-sized vessels, and the tissue about these areas was deeply injected.

The aorta had scattered over its surface many small yellow, opaque, prominent areas.

The nerves of the lumbar and sacral plexus, as well as the pneumogastric, on either side, were removed for microscopic examination. No gross change was apparent. The dura of the cord was distended with considerable clear, rather thick, serous fluid. No gross lesions were apparent in the cord.

Bacteriological Report. Cultures from the heart, liver, and spleen

were sterile. Those from the kidney gave colon bacillus and liquefying organisms. Cultures from the spinal cord showed liquefying organisms.

The stains used in the examination of these two cases were those of Nissl and Lenhossek for the ganglion cells; Weigert's and Pal's myelin sheath stains, phosphomolybdic acid hæmatoxylin, hæmatoxylin and eosine; Van Gieson's picric acid and acid fuchsin stain; Mallory's methods of staining the neuroglia fibres with gentian-violet, and phosphotungstic acid hæmatoxylin; and Weigert's and Loeffler's stains for micro-organisms; together with Marchi's method of staining for fat. For the peripheral nerves, Marchi's and Weigert's methods and hæmatoxylin and eosin were the stains used.

After hardening, the anterior portions of the gray matter showed darker in color than the remainder of the gray matter of the cord.

Sections of the lumbar cord stained by Pal's method showed the white matter of the cord with low power normal, except that the small blood-vessels entering from the membranes were dilated and filled with blood.

There was no marked degeneration in any of the nerve-tracts. The posterior nerve-roots were normal. The anterior nerve-roots showed very marked degenerations, fully two-thirds of the fibres having disappeared. The posterior horns of the gray matter were perfectly normal, both as to nerve-cells and fibres. The anterior horn on the right side was totally replaced by an apparently homogeneous grayish area. In the left horn the condition was the same, but there remained unaffected a small portion toward the anterior fissure, which was about one-fourth of the total anterior horn.

On examination with a high power there were seen in the white matter of the cord numerous single nerves which were degenerated. Some of them were greatly swollen, the myelin sheath often very thin and more or less broken up, and occasionally there were drops of myelin within the myelin sheath. The posterior nerve-roots showed very few degenerated fibres. Occasionally one was seen where the myelin sheath was thinner than normal. In the anterior nerve-roots a greater part of the nerve-fibres had disappeared. Of those that remained about one-half appeared normal. In the others the myelin sheath was reduced to a mere thread, and large, irregular drops of myelin were present. In the posterior horns of the cord the nerve-fibres and cells appeared unchanged. In the anterior horns the portions which with the low power presented the homogeneous appearance were seen to be made up of a mass of smaller and larger cells, some containing sharply staining nuclei, others with indistinct nuclei, and here and there in the left horn near the borders of the degenerated area were large, irregular masses of myelin and occasional cells staining a homogeneous brown, apparently degenerated nerve-cells, only one or two of which show any signs of a nucleus remaining. Many of these small cells throughout the degenerated area contained irregular drops of myelin staining black, and at the borders of the area were occasional large masses of myelin or remains of a degenerated myelin sheath.

Sections of the lumbar cord stained with hæmatoxylin and eosin showed dilatation and injection of the small bloodvessels extending into the cord, both those from the periphery of the cord as well as those from the anterior fissure. In many of the vessels the perivascular lymph space was entirely filled with large and small lymphoid cells, which also infiltrated the wall of the vessel itself.

The vessels of the posterior column of the cord and of the posterior nerve-roots showed only very slight infiltration of the perivascular space. Many of them were entirely normal. In the anterior nerve-roots about the smaller vessels there was considerable infiltration with round cells, and round cells were seen with greater frequency than normal all through the substance of the nerve-root. These cells were usually small, with small, round, deeply-staining nuclei, but many of them had large, single, faintly-staining nuclei, oval or round in shape, nearly filling the cell body.

The white matter of the cord in the lateral columns showed, aside from the infiltration about the bloodvessels, practically normal appearances. Some of the small vessels contained an accumulation of leucocytes, from which apparently a slight emigration into the surrounding tissue was taking place. This was not generally true. In the majority of the vessels there was no such accumulation of the leucocytes, but there was a small, round-cell infiltration of the vessel walls and of the perivascular lymph spaces. This infiltration about the vessels was more marked in the case of the arteries. Most of these cells were small, with round, very deeply-staining nuclei, almost filling the cell. Others, fewer in number, with slightly granular protoplasm, contained a round or oval granular nucleus which stained intensely. Leucocytes were few in number. There was no hemorrhage about the vessels in the substance of the cord.

The degenerated portions of the anterior horn of the gray matter appeared totally disorganized. Only occasionally in the borders of this area could be seen the remains of nerve-cells. These were small, shrunk, homogeneous-staining masses of protoplasm, occasionally showing indications of processes. In a few of them, one portion, taking the hæmatoxylin more deeply than the rest, showed the indistinct remains of the nucleus.

The degenerated area itself consisted of a disorganized mass of cells and detritus. These cells varied in size, some of them being small, round, lymphoid cells, with round, deeply-staining nuclei, surrounded by a narrow band of clear protoplasm. Other cells were similar to the large lymphoid cell with nucleus rather small in relation to the cell body, and the nucleus divided into a number of granules with more or less reticulum between them. These cells were the plasma cells of Unna. The protoplasm was finely granular, and with methylene-blue stained more deeply than that of other cells. They were found chiefly in the vicinity of the vessels, but also to a certain extent scattered among the other cells. Very rarely there were seen large round cells with irregular, less deeply-staining nuclei similar to those of leucocytes.

The small round cells similar to lymphocytes were comparatively few in number. There were also scattered about a considerable number of large vesicular cells; in some of them the nucleus was round, in others similar to that of a leucocyte. These cells were the ones spoken of below as containing the drops of myelin and fat. There were numerous larger and smaller hyaline masses scattered through this area, sometimes drawn out, sometimes in rounded masses, evidently the remains of nerve-cells and nerve-fibres. One of these masses was found partially surrounded by a large vesicular cell. Occasionally throughout the whole of this area large vesicular cells were seen filled with drops of fat and myelin, as was shown by the sections stained according to Pal and

Marchi. These sections also showed the presence of fat and myelin drops in a large portion of the smaller lymphoid cells. Scattered throughout this area were masses of myelin or fat not contained in cells. Occasionally about one of these drops of myelin could be seen a portion of a degenerated myelin sheath. This same section showed that the degeneration of nerve-fibres in the lateral columns, while involving numerous nerve-fibres, was still moderate in amount. The same was true of the posterior nerve-roots. The anterior nerve-roots showed signs of very extensive destruction of the myelin sheaths.

Sections stained with phosphomolybdic acid showed nearly normal conditions in the white matter of the cord and of the posterior horns of the gray matter. There were almost no nerve-cells in the anterior horn.

Sections stained by Nissl's method showed the presence of perfectly normal nerve-cells in the posterior horns; while in the anterior horn on the right side in one section there were only four nerve-cells, two of which were irregular, round masses of protoplasm containing no granules, with intensely-staining nuclei. The other cells showed the nucleus and nucleolus somewhat more plainly; the granules were fairly distinct, but smaller than normal. But one or two processes could be seen to be given off from the cells, and these could be traced but a very short distance from the cell-body, apparently ending abruptly.

In one of these sections a cell lying in the wall of a vessel showed in its nucleus a karyokinetic figure.

Sections of the lumbar cord stained by Mallory's stain for neuroglia showed no increase in the neuroglia anywhere in the cord, and practically complete absence of the neuroglia fibres in the degenerated areas of the anterior horn.

Sections of the dorsal and cervical cord showed practically the same conditions that were seen in the lumbar regions. The degeneration of the anterior nerve-roots was fully as extensive as in the lumbar sections, while the posterior nerve-roots showed practically normal conditions.

In the dorsal cord the disintegrated area in the anterior horns of the gray matter, the infiltration of the bloodvessels of the cord and of the anterior nerve-roots was fully as extensive as lower down. In the cervical cord, the right anterior root showed only a small area of degeneration in its anterior portion. The left horn showed more extensive degeneration involving the anterior and median portions of the horn from its base down to the centre of the gray commissure. Infiltration about the bloodvessels of this portion of the cord was less extensive than lower down, but many of the vessels were widely dilated and filled with red blood-corpuscles, with comparatively few leucocytes, while the infiltration of the walls of the vessel was extensive in some portions and very little in others.

Sections of the cord at various places stained by Weigert and Loeffler's methods for micro-organisms failed to show the presence of any organisms.

Sections of the sciatic nerve stained by Marchi's method were in general normal. The longitudinal sections showed slight degeneration of the myelin sheath. Cross-sections of the nerve showed similar degeneration, but not very extensive.

Sections of the pneumogastric nerve showed marked fatty degeneration. In the longitudinal sections there was a great deal of fat in the myelin sheath. In addition, the sheath was swollen and in many places

had a grayish tinge. The axis-cylinder was also swollen and beaded. In places where the nerve-sheath was most degenerated the axis-cylinder was not apparent. In other places where the myelin sheath was swollen and grayish it was difficult to make out the axis-cylinder. Cross-sections of this nerve showed in places swollen nerve-sheaths without axis-cylinders. Other nerve-fibres showed fat-granules often within the myelin sheath and lying close to the axis-cylinder. The nerves in which the myelin sheath was granular, grayish, and swollen, here showed more evidence of the presence of fat-globules than was shown in the longitudinal sections. In the anterior crural nerve the nerve-sheaths occasionally showed slightly degenerated fibres, but these were less numerous than in the other nerves. The phrenic nerve showed a much less degree of degeneration than the pneumogastric. The nerve-fibres replaced by fat-granules were much less numerous, but in the grayish swollen nerve-sheaths swollen and beaded axis-cylinders were often evident.

Sections of the pneumogastric nerve stained with hæmatoxylin showed the axis-cylinder of many of the fibres distinctly swollen and beaded. The bloodvessels were injected everywhere, and in the sheath of the vessels there were numerous round cells and, in places, slight accumulations of round cells, which often extended from the connective tissue slightly into the nerve.

SUMMARY OF MICROSCOPIC EXAMINATION. 1. Acute inflammatory exudation of the anterior horns of the gray matter, with parenchymatous degeneration of the nerve-cells and processes.

2. Infiltration of perivascular lymph spaces and dilatation of vessels of the anterior horns.

3. Moderate infiltration about the vessels of the posterior horns and of the white matter of the cord.

4. Slight parenchymatous degeneration of the nerve-fibres of the white matter of the cord.

5. Slight degeneration of the posterior nerve-roots and marked degeneration of the anterior nerve-roots.

6. Parenchymatous degeneration and perivascular infiltration of the peripheral nerves.

7. Absence of micro-organisms in sections and cultures.

Anatomical Diagnosis. Broncho-pneumonia of left lung. Chronic, diffuse nephritis. Arterio-sclerosis of aorta. Myoma of uterus. Acute anterior poliomyelitis.

CASE II.—V. F., male, aged thirty-five years, married, was born in Italy, and his occupation was that of a laborer. The patient entered the Boston City Hospital, October 5, 1896. His family history was negative. He had been four years in Boston. He denied the use of alcohol, and, so far as known, had been well and strong up to twelve days before. At that time he began to be troubled by numbness and weakness in his legs. This increased for two days, at which time he was obliged to give up work and go to bed. He had very little pain, and no nausea or vomiting. He was said to have had one attack of dyspnoea on the day of his entrance into the hospital. He ascribed his trouble to exposure to cold and rain. His chief complaint was numbness in the legs.

Physical Examination. The patient was a well-developed and nourished man. The pupils were equal in size and reacted to light. The

tongue was protruded straight, and was moist, with a slight coating. The pulse was regular, of good strength and volume. The area of cardiac dulness, the cardiac sounds, and action were all normal.

The resonance over the lungs was good throughout. The respiration everywhere was accompanied by squeaking and sonorous râles, and a few coarse, moist râles.

The areas of liver and splenic dulness were normal. The abdomen was negative. There was marked paralysis of both lower extremities, the only motion possible being a slight flexion of the knees. There was also marked weakness of the muscles of the trunk and neck. The head could be rotated, but not raised. There was a very slight power of contraction of the abdominal muscles, and a marked loss of power in all the muscles of the upper extremities. The arms could be raised very slightly only; the grasp was weak. The patellar reflexes were absent, as were also the reflexes of the arms. The plantar reflexes were present, but very slow. The cremasteric and abdominal reflexes were normal. The sensation for pain was everywhere normal. There was no tenderness along the spine or over the great nerve-trunks.

Examination of the urine made October 6th showed the color normal; the specific gravity 1.025; acid reaction; chlorides increased. Albumin, bile pigments, and sugar all absent. On October 7th it was noted that the patient complained of no pain, and took his nourishment well. There was no retention of urine, but the bowels had not moved. In the night he had an attack of dyspnœa, and had been unable to expel the mucus from his throat. That morning marked conjunctivitis was noted. At 6.30 o'clock that evening he began to have severe dyspnœa, the pulse became weak, and the extremities cold. He was given strychnine subcutaneously, but died at 7 o'clock.

CHART.

	Temperature.		Pulse.		Respiration.	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
Oct. 5th,	98.6	98.6	96	88	24	24
6th,	98	98.4	80	92	20	24
7th,	97.8	97.2	124	120	24	32

Autopsy, October 8, 1896. The body was that of a man about forty years of age. Body small, tolerably well nourished. Rigor mortis extremely well marked.

Scalp normal. Skull of ordinary thickness; dura not adherent; rather hyperæmic. The inner meninges and the brain itself hyperæmic. The gray matter of the brain had a pinkish hue on section. The hyperæmia seemed to be best marked in the great ganglia at the base.

Subcutaneous fat normal in amount. Muscles well developed. The spinal canal was opened in its entire extent, and the cord, together with most of the posterior nerve-roots, removed. A number of the spinal ganglia were removed with cord. The meninges of the cord were hyperæmic. The cord itself was well preserved, somewhat hyperæmic; nothing abnormal in the nerves. Long pieces of each sciatic nerve were removed.

In the posterior portion of both lungs, especially the left lung, and in this also along the anterior lateral border, there are numerous dark

areas from which occasionally some pus could be expressed from the bronchi. Others seemed to be due entirely to hemorrhage. In the bronchi there was some muco-purulent exudation.

Heart of ordinary size, weight 240 grammes; valves normal; myocardium very dark.

Spleen, weight 175 grammes; very lax, slightly enlarged; on section, of pale brownish color; Malpighian bodies not visible; trabeculae slightly increased. The kidneys together weighed 175 grammes. Both of about the same size; both intensely hyperaemic; markings normal; capsule easily stripped off.

Liver, weight 1200 grammes. Dark red; on section, hyperaemic; markings faintly visible. The gall-bladder contained thin, dark bile.

The adrenal glands normal. Pancreas hyperaemic and extremely soft.

The mucous membrane of the entire intestinal canal normal, save just above the ileo-caecal valve, where there was very slight enlargement of the follicles. The mesenteric glands were enlarged and reddened.

Arteries and veins normal.

Bacteriological Examination. Cultures from heart, liver, spleen, kidneys, meninges of brain, and spinal cord were sterile. Four cultures were taken from the brain, three from the meninges of the brain, and one from the spinal cord. Three of these (two from brain and one from meninges) showed no growth. Dilutions and replants from the others showed nothing but saprophytes (a spore-forming bacillus), a large coccus, and a large diplococcus.

Microscopical Examination. Sections of the lumbar cord stained according to Pal showed no changes in the white sections of the cord. The fibres and nerve-cells of the gray matter appeared normal, the nerve-cells being present in normal numbers and showing no changes by this stain. The nerve-fibres in the gray matter were also unchanged. The bloodvessels in the anterior horn appeared distended and filled with blood. There was no infiltration of their walls, but the perivascular lymph spaces of some of them were dilated. The posterior nerve-roots were normal. The anterior nerve-roots showed degeneration of a considerable number of nerve-fibres.

Sections stained with phosphomolybdic acid showed no diminution of nerve-fibres and no changes in the nerve-cells. The axis-cylinders of the anterior roots were occasionally absent, while others stained poorly.

Sections stained with hæmatoxylin and eosin showed no changes beyond the dilatation of the vessels in or near the gray matter of the cord. These vessels contained generally red blood-corpuscles and only a few leucocytes. There was no infiltration of the walls of the vessels. In others of these vessels there was an accumulation of small round cells, with deeply-staining nuclei.

Sections stained for neuroglia showed no increase of this substance anywhere in the cord.

Sections stained with Nissl's stain showed that in a large majority of the cells of both anterior horns there was a diminution of the protoplasmic granules. In some cells there remained in the periphery of the cell nearly normal granules, while the central portion of the cell showed a slightly yellowish homogeneous appearance dotted with a few very small, irregular granules, with no signs of nucleus or nucleolus. In other cells the nucleus could not be made out, but the nucleolus stained

indistinctly, and the whole body of the cell was filled with very fine granules, like dust, with very few or no normal granules. Those which were present were only seen at the periphery of the cell. Other cells showed finely granular detritus at one end of the cell, while the other was clear, showing no granules whatever, with no signs of nucleus or nucleolus anywhere to be seen. The cell-processes even of these degenerated cells appeared normal. The cells seen in other portions of the gray matter showed normal granules and nucleus and nucleolus. In the anterior horn, along with these changed cells, were others which appeared nearly or quite normal, the only thing noticeable in them being an irregularity in the size of the granules.

Sections stained according to Weigert and Loeffler showed no micro-organisms present in the substance of the cord. Sections of the dorsal and cervical cord at various places showed the same changes in the large motor cells of the anterior horns, fully one-half of the cells of the dorsal region of the cord being affected, though to a slighter degree than the cells of the lumbar cord. Changes in these cells again became more marked and involved a greater number of the cells in the cervical portion of the cord.

Sections of the medulla stained by Nissl's method showed no changes in the nerve-cells, the granules being sharp and clear, the nucleoli staining well, and the nerve processes appearing normal. In the sections of the cortex of the brain, in some of the larger nerve-cells the granules were smaller than normal and more or less irregularly scattered throughout the whole cell-body. No cells were seen where the granules had disappeared or where they had been replaced by granular dust. The smaller cells of the cortex appeared normal.

Sections of the dorsal and lumbar spinal ganglia stained by Nissl's method showed the ganglion cells in general quite normal. Occasionally one was seen containing a vacuole, while in all of them the protoplasmic granules were rather small. Otherwise the sections of these ganglia appeared perfectly normal.

Sections of the left anterior crural nerve treated by Marchi's method showed numerous fat-globules within the nerve-sheaths. In places the nerve-sheath was entirely replaced by fat-globules. The axis-cylinder had completely disappeared. Other fibres showed a brownish discoloration of the nerve-sheath, which was more granular and swollen than normal, while the axis-cylinder was swollen and beaded. These changes were seen to a greater or less extent in more than half the fibres in the section.

Cross-sections of the same nerve showed drops of fat in the myelin sheath, in other places occupying the centre of the sheath, the position of the axis-cylinder which had disappeared. Other fibres showed a thin line of fat in the myelin sheath. The nerve-fibres varied somewhat in size, but the greatly swollen ones were comparatively few in number, and in these the axis-cylinder could not be made out at all, the centre staining a homogeneous gray color, or the whole nerve-fibre being represented by a single large globule of fat.

The left sciatic nerve, in longitudinal section, showed the same condition as the anterior crural nerve, but affecting a greater number of fibres, and the fat-drops were much more numerous; seldom was a nerve-fibre seen which was free from them, while the beaded appearance of the axis-cylinder was seen in a greater number of them.

Cross-sections showed comparatively few of the nerve-fibres unaffected by changes. The majority of them were replaced by fat-globules, while most of the remainder were stained a grayish brown.

The right sciatic nerve showed similar changes, which were as well marked and fully as extensive as in the left sciatic nerve, fully three-fourths of the fibres in the cross-sections being more or less extensively degenerated.

Sections of the left sciatic nerve stained with hæmatoxylin showed an increase of the connective-tissue nuclei throughout the nerve, and considerable infiltration of small lymphoid cells in the walls of the vessels and about them, both outside and within the nerve-bundles proper. In cross-sections about one-half of the axis-cylinders could be seen, but many of those present were much smaller than normal, while others were greatly swollen, and in many cases the axis-cylinder could not be made out. Infiltration of the vessel walls was well marked in this section also.

Sections of the left anterior crural and right sciatic nerves stained with hæmatoxylin and eosin showed changes similar to those described in the left sciatic nerve, though in the former nerve the proliferation of nuclei and the infiltration of the vessel walls were much less marked.

In sections of the left anterior crural nerve, stained with Weigert's nerve-sheath stain, the majority of the fibres were seen to retain the myelin sheath, approximately one-third of them only being affected by degenerative processes.

SUMMARY. Microscopic examination showed: 1. Parenchymatous degeneration, varying in extent, of the peripheral nerves, present to a greater or less extent in all the nerves examined.

2. Degenerative changes in the large ganglion cells of the anterior horns of the cord, with destruction and fragmentation of the protoplasmic granules and loss of the nuclei of the cells.

3. The nerve-cells of other portions of the gray matter of the cord, medulla, brain, and spinal ganglia unchanged.

4. No change of the white matter of the cord.

5. Absence of micro-organisms in the tissues.

Anatomical Diagnosis. Broncho-pneumonia and hemorrhage of the lungs. Enlargement of the spleen. Congestion of the kidneys. Congestion of the brain and cord. Parenchymatous degeneration of peripheral nerve and motor cells of cord.

After Landry's original publication, there were published in the same year by Kussmaul some similar observations. Yet neither of these papers attracted much attention until Pelegrino Levi in 1865 published another paper upon this disease, and ascribed the death of the celebrated zoölogist Cuvier, who had died of an acute descending paralysis, to this cause.

In 1871 Bernhardt expressed the opinion that the disease was due to a poison. This conception that Landry's paralysis depended upon an intoxication was accepted by Westphal, who in 1876 characterized the

disease as one with a progressive, ascending, finally fatal course, with retention of the electrical irritability of the paralyzed muscles, with negative results upon autopsy. This conception of Westphal was soon very much widened, and numerous cases were reported from all sides, which varied in the widest way from the descriptions hitherto given of the disease.

In 1889 Ross, in a series of articles, maintained that this disease was identical with peripheral neuritis. This view was also held by Nauwerck and Barth, in a paper published by them in the same year, and has been the cause of numerous discussions since. The earlier autopsies gave generally negative results, but, as time went on, those in which pathological changes were found began to be more numerous, and it may be assumed that the previous failures to find pathological changes were in many instances due to imperfect methods of examination.

Again, the great diversity of lesions described can undoubtedly be explained from the fact that many writers included cases which probably belonged in classes by themselves. Many of Ross's cases, for instance, must certainly be considered as cases of peripheral neuritis, and the same is true of many other cases which have been published as Landry's paralysis. On the other hand, cases have been published and included in tables where the lesion was a disseminated or localized myelitis or a general central myelitis. Therefore, in the discussion of the pathological changes in Landry's disease, many cases which have been published under this title have been omitted, for reasons which seem sufficient. No attempt has been made to examine cases where a pathological examination was not made.

Among the cases which have been reported where the pathological examination resulted negatively was the original one of Landry,¹ where there was said to have been congestion of the membranes, but no lesion in the brain or cord. The peripheral nerves were not examined.

In Pelegrino Levi's case² the nerve-roots, spinal ganglia, vagi, cord, sympathetic and pneumogastric nerves were normal. In the second case reported by him, that of Baron Cuvier, there was no examination made.

Oulmont and Hayem³ found in their case the spleen enlarged and a slight injection of the pia in the upper part of the cord; the gray matter of the cord reddened, and congestion of the capillaries. After hardening in chromic acid, there could be found no appreciable alteration anywhere. The muscles microscopically were irregularly striated and in places waxy degenerated.

¹ Landry. Sur la paralysie ascendante aiguë. *Gaz. hebdom.*, 1859, vol. vi. p. 472.

² Pelegrino Levi. Contribution à l'étude de la paralysie ascendante aiguë, etc. *Arch. gén. de méd.*, 1865, 6 série, vol. i. p. 129.

³ Oulmont and Hayem. Paralysie ascendante aiguë. *Gaz. des hôp.*, 1867, vol. xl. p. 405.

G. Harley and J. Lockhart Clarke¹ found congestion of the vessels of the cord and of the pia, with a softening of the anterior column, which involved the anterior nerve-roots, and more or less of the gray matter of the cord. The medulla appeared normal.

M. Bernhardt² found the brain, medulla, and cord normal. The vagi, sciatic, and sympathetic nerves were also normal. The specimens were examined after hardening in Müller's fluid, and fresh. No cultures were made. There was acute hyperplastic splenitis.

C. Westphal³ reported four cases. In the first there was bronchitis, and tuberculosis was found in the lungs. The spleen was enlarged. The cord and medulla stained with carmine were normal.

In his second case the spleen was found slightly enlarged; the brain, cord, nerve-roots, ganglia, and muscles were normal; moderate degeneration of one of the crural nerves was found. There were no bacteria present in the blood.

His third and fourth cases probably do not come under the head of this disease of which we are speaking.

O. Kahler and A. Pick⁴ found an acute hyperplastic splenitis. The cord was normal. There were adhesions between the spinal dura and pia. The nerves were not examined. The specimens were stained with carmine after hardening in Müller's fluid.

H. Kümmell⁵ found enlargement of the spleen. The cord was examined after hardening in Müller's fluid and staining with carmine, hæmatoxylin, and methyl-violet. The cord was normal. The peripheral nerves were not mentioned. There was a bilateral hemorrhage in the medulla, without any infiltration of the tissues in the neighborhood with leucocytes. This patient had died of paralysis in the fourth week of typhoid, and the characteristic lesions of typhoid were found in the intestines.

A. Strümpell,⁶ in his case, reports enlargement of the spleen, and that the cord, microscopically, was not pathological. The peripheral nerves were not examined.

In Mann's case⁷ the spleen was not enlarged; the cord, medulla, and brain were normal. The peripheral nerves were not examined.

¹ Harley and Clarke. A Fatal Case of Acute Progressive Paralysis. *Lancet*, 1868, vol. ii. p. 451.

² Bernhardt. Beitrag zur Lehre von der acuten allgemeinen Paralyse. *Berlin. klin. Woch.*, 1871, vol. viii. p. 561.

³ Westphal. Ueber einige Fälle von acuter tödtlicher Spinallähmung. *Arch. f. Psych.*, 1876, vol. vi. p. 765.

⁴ Kahler and Pick. Zu der Lehre von der acuten aufsteigenden Paralyse. *Arch. f. Psych.*, 1880, vol. x. p. 313.

⁵ Kümmell. Zur Lehre von der acuten aufsteigenden Spinalparalyse. *Zeitsch. f. klin. Med.*, 1881, vol. ii. p. 273.

⁶ Strümpell. Zur Kenntniss der multiplen degenerativen Neuritis. *Arch. f. Psych.*, 1883, vol. xiv. p. 333.

⁷ Mann. Landry's Paralysis. *Med. Chron.*, Manchester, 1887, vol. vi. p. 99.

Greppin,¹ in his case, found the brain, cord, peripheral nerves, the spinal ganglia, and nerve-roots healthy. Cultures were negative.

J. A. Ormerod² reports three cases. In his first the spleen was large and soft. The brain, sciatic and vagus nerves were normal. The stains used were Weigert's, picrocarmine, and aniline blue-black. The cord, stained with carmine, Pal's stain, aniline blue-black, also showed no changes. In his second case the spleen was also enlarged. The cord, hardened in Müller's fluid and stained in aniline blue-black, showed no changes. The anterior tibial nerve, hardened in Müller's fluid, and the cauda equina, hardened in osmic acid, were both normal. In the third case the spleen is reported as rather larger than normal, weight ten and a half ounces, and soft. The nerves, treated with osmic acid and Müller's fluid and stained with picrocarmine or Pal's stain, showed nothing abnormal. In one vagus nerve, however, some of the fibres seemed to take Weigert's stain more deeply than they ought. The cord, stained with picrocarmine, aniline blue-black, and by Pal's method, was normal.

J. Watson,³ in his case, reports the membranes of the cord slightly congested, and says that no changes noticeable to the naked eye were present. He also adds that sections of the cord were hardened and examined microscopically, but threw no light upon the pathological changes.

A. Albu⁴ reports in his case the spleen of normal size and consistency. The membranes of the cord were injected to a moderate degree. The cord was normal. The brain was rich in blood, and showed small hemorrhages in places. The cord was hardened in Müller's fluid and stained with carmine, nigrosin, and Weigert's stains, and showed nothing microscopically, and the bacteriological and microscopical examination of the crural and axillary nerves was negative. Cultures made from the blood, spleen, and cord were also negative.

Von Leube⁵ reported a case in which the cord and peripheral nerves showed no changes. They were hardened in Müller's fluid.

M. Prince⁶ reports a case in which the cord was microscopically normal. The nerves of the brachial plexus, stained by Weigert's method, showed no changes.

B. Robinson⁷ reports a case in which the spleen was normal. In the

¹ Greppin. *Correspondenzbl. für schweizer Aerzte*, 1892, vol. xxii. p. 517.

² Ormerod. *Illustrations of Landry's Paralysis*. St. Barth. Hosp. Reports, 1892, vol. xxviii. p. 137.

³ Watson. *Acute Ascending (Landry's) Paralysis*. *British Med. Journ.*, 1892, vol. ii. p. 1286.

⁴ Albu. *Zur Aetiologie der Paralysis ascendens acuta, etc.* *Zeitschr. f. klin. Med.*, 1893, vol. xxiii. p. 387.

⁵ Von Leube. *Diagnose der inneren Krankheiten*. Leipzig, 1883, vol. ii. p. 143.

⁶ Prince. *A Case of Landry's Paralysis with Autopsy*. *Journ. of Nerv. and Ment. Disease*, 1895, vol. xxii. p. 686.

⁷ Robinson. *A Case of Landry's Paralysis*. *Med. Rec.*, 1895, vol. xlvii. p. 534.

brain and spinal cord the bloodvessels appeared somewhat congested, but there was no softening. The cerebral convolutions were flattened, more especially over the right parietal lobe, where there was some bulging. In the right parietal lobe a tumor, two and one-half inches in diameter, firmer than the brain tissue, but rather soft, was found. This was found to be a spindle-cell sarcoma. Sections of the cord stained by Weigert's hæmatoxylin, Delafield's hæmatoxylin, and Van Gieson's stain showed no lesion, either inflammatory, degenerative, or of other nature.

This completes the cases found in the literature where the microscopic examination showed no changes. The cases in which changes have been found, but in the peripheral nerves only, or where the changes in the cord were so slight that no importance was attached to them by the writers, are the following :

Dejerine and Goetz¹ found in the cord, hardened in chromic acid and stained with carmine, no changes except that the vessels were somewhat dilated. In the nerves they found degeneration of the nerve-fibres, with increase of the nuclei of the neuroglia, in some of the anterior nerve-roots.

H. Eichhorst² found the spleen small; the brain and cord normal. The optic nerves and the optic chiasm were red in color. The peripheral nerves showed evidences of neuritis. This case, clinically, showed a marked diminution of sensation, with pain and tenderness in the extremities, and probably belongs to the cases of peripheral neuritis, as there were no bulbar symptoms. The case developed three weeks after an attack of malaria.

Dejerine³ reported a case in which the brain and cord were negative; but there were alterations, which he considered of a parenchymatous nature, in the anterior nerve-roots and in the intramuscular nerves.

Curschmann⁴ reports a case in which the spleen was four times the normal size. The intestine showed the characteristic changes of typhoid fever, from which the patient was suffering. The brain was normal in appearance. The pia of the cord was hyperæmic; the cord was said to be otherwise normal, except in the lumbar region, where the gray matter was slightly reddened. Upon microscopical examination of the cord a few small areas were seen in the lateral columns, which showed "a sort of swelling with thinning of the axis-cylinders," but no complete destruction of them. The cultures from the lumbar and dorsal cord were negative. Cultures from the upper dorsal and cervical cord and spleen

¹ Dejerine and Goetz. Note sur un cas de paralysie ascendante aiguë. Arch. de physiol., 1876, 2 série, vol. iii. p. 312.

² Eichhorst. Neuritis acuta progressiva. Virch. Arch., 1876, vol. lxi. p. 265.

³ Dejerine. Recherches sur les lésions du système nerveuse, Paris, 1879.

⁴ Curschmann. Bemerkungen über das Verhalten des Centralnervensystems bei acuten Infectionskrankheiten. Verhandlungen des V. Congresses für innere Med., 1886, vol. v. p. 469.

showed the presence of the typhoid bacillus, which was also demonstrated by inoculations. Bacilli were found in the sections of the cord only in the white substance of the cervical and upper dorsal regions.

A. Nauwerck and W. Barth¹ reported a very typical case, except that the duration was somewhat prolonged (three months). The cord, hardened in Flemming's solution, as well as the medulla, showed no changes. The peripheral nerves showed a moderate degeneration. The lungs were the seat of a beginning tubercular process.

Ross² found the internal, antero-lateral, and postero-lateral groups of nerve-cells normal, while the central and median were diseased. There was "granular degeneration of the nerve network," with disappearance of the ganglion cells and increase of the nuclei, together with dilatation and congestion of the bloodvessels. In his second case he could discover no trace of disease in the cord. In an article published later,³ in speaking of his first case, he says that after further study he came to the conclusion that the changes in the gray matter of the spinal cord were a minor matter.

C. Eisenlohr,⁴ in his case, reports the spleen very large, containing no infarctions. In the ileum there were hemorrhages and swelling of the follicles, with enlargement of the mesenteric glands. The brain, cord, and medulla, stained with borax-carmin, nigrosin, and Weigert's stain, showed no changes. There was degeneration of the bulbar and peripheral nerves. Cultures were negative as regards bacteria, as well as smears upon cover-glasses, and the sections.

In his second case he found abundant serum in the spinal canal and the pia slightly oedematous. The spleen was not enlarged, but there was slight swelling of the mesenteric glands and of the follicles of the ileum, where were also found tubercular ulcers. The cord in the eleventh and twelfth dorsal segments showed swollen axis-cylinders in the lateral columns and degenerative products of the medullary substance. The gray matter was normal. He described this as an acute myelitis. The stains used were nigrosin, carmin, picrocarmin and hæmatoxylin. The right vagus was slightly degenerated; the left one normal. The lower cervical and upper dorsal anterior roots showed signs of degeneration. The anterior roots of the lumbar enlargement showed an increase of cells of the connective tissue and adventitia, but no degeneration. There was no degeneration present of the sacral roots. The right tibial nerve was degenerated. Cultures showed two organisms. The first was found in the cord, the spleen, the sciatic nerve, and was the staphylococcus cereus albus. The second organism was found in

¹ Nauwerck and Barth. Zur path. Anatomie der Landry'schen Lähmung. Zieg. Beiträge zur path. Anat. und allg. Path., Jena, 1889, vol. v. p. 1.

² Ross. Diseases of the Nervous System, second edition, New York, 1883, vol. i. p. 908.

³ Ross. Peripheral Neuritis, Med. Chrou., Manchester, 1889, vol. x. p. 376.

⁴ Eisenlohr. Ueber Landry'sche Paralyse. Deut. med. Woch., 1890, vol. xvi. p. 841.

the spleen and sciatic nerve only, and was the staphylococcus pyogenes aureus. No tubercle bacilli were found. In the sections there were found a long and short bacillus and a coccus.

Hun¹ reports in his case a slight cerebral and spinal meningitis, with infiltration of the walls of the spinal veins. Aside from a degeneration of some fibres of the anterior roots of the cauda equina, the nervous system was normal. No bacteria were found in the tissues, and cultures made from them were negative.

E. Centanni² reports in his case that the vessels in the nerves were engorged and the walls were somewhat infiltrated. The nerve-fibres were not much altered. He designates the process as a slight degenerative interstitial neuritis. The cord showed congestion in the vessels of the pia, exudation about the central canal, and some atrophy in the peripheral zone of the cord. Other parts were normal. In the peripheral nerves he found a slender bacillus, with rounded ends, without spores or characteristic grouping. These were usually present in the endoneural lymph spaces. These bacilli were not found elsewhere. No cultures were made.

Giuzetti³ found the spleen large and soft. There was some disintegration of the nerve-fibres of the cord, which was most marked in the lumbar region; absent in the medulla. The ganglion cells were cloudy, with indistinct nuclei. About the vessels there was a ring of granular substance not staining like fibrin; there were also recent punctiform hemorrhages in the medulla and pons. There was degeneration of both anterior and posterior nerve-roots, but most marked in the anterior ones. In the peripheral nerves there was multiplication of the nuclei and infiltration of some of the vessels. No bacteria were seen in the sections. Cultures made from the brain, cord, sciatic nerve, blood, spleen, mesenteric glands, and urine were all negative, except two tubes from the sciatic nerve and one from the cord, upon which grew a chromogenic bacillus. A rabbit injected with an emulsion of the spinal cord and spleen gave negative results.

The following are the cases found in the literature in which the changes in the cord were marked, whether or not degeneration of the peripheral nerves was found:

P. Baumgarten⁴ reported in 1876 a case which is interesting as having been the first in which bacteria were found. These bacilli he identified as the anthrax bacillus. They were found in the lungs, in the spleen,

¹ Hun. The Pathol. of Acute Ascending (Landry's) Paralysis. New York Med. Journ., 1891, vol. liii, p. 609.

² Centanni. Ein Fall von Landry'scher Paralyse. Ziegler's Beiträge zur path. Anat. u. allgem. Path., Jena, 1890, vol. viii, p. 358.

³ Giuzetti. Riform. Med., 1894, vol. ii, pp. 5, 19, and 31. Quoted by Bailey and Ewing.

⁴ Baumgarten. Ein eigenthümlicher Fall von Paralyse ascendante aiguë mit Pilzbildung im Blut. Arch. f. Heilkunde, 1876, vol. xvii, p. 245.

the spinal cord, and the blood. Cramer, in his review of the literature of Landry's paralysis, questions whether this identification of the bacillus found would be accepted at present. Baumgarten found a hyaline substance in the gray matter of the cord, in the commissure, the anterior fissure, and in the perivascular spaces, which he considered an inflammatory exudation. The vessels were distended with blood, and some were filled with pus-corpuscles.

C. Eisenlohr¹ found in his case the spleen enlarged and soft. The gray substance of the spinal cord was hyperæmic. After hardening in Müller's fluid the cervical cord showed exudation about the central canal and the vessels of the gray matter and in the anterior fissure. The nerve-cells were filled with granular pigment. These changes diminish both above and below, but the same appearances were found in the upper lumbar cord. The medulla showed cellular infiltration about the vessels, and the ganglion cells were swollen and shining, and here and there were capillary hemorrhages. The peripheral nerves were normal.

Schulz and Schultze² reported a case which is probably to be regarded as transitional between the typical cases of Landry's paralysis and the paralysis of Duchenne, in that the course was rather long (sixty days). They found degenerative processes in the lateral and pyramidal tracts, as also in the posterior columns. There was infiltration about some of the vessels. There were alterations in the gray matter in the anterior horns, particularly in the lumbar region; the ganglion cells were swollen, granular, and vacuolated. Swollen axis-cylinders were seen in the gray matter and also in the anterior roots. The same changes, but less intense, were found in the dorsal and cervical cord. In the posterior nerve-roots of the lumbar and cervical cord there was seen an occasional swollen axis-cylinder. These abnormal axis-cylinders were also seen in the facial nucleus; otherwise the medulla was normal. There were no bacilli found in the blood. They summed up the changes as consisting of a myelitis of the motor tracts and of the anterior gray substance of the whole cord, and of the lower part of the medulla. There were slight degenerative changes found in the sciatic, ulnar, and peroneal nerves.

Among these cases, in which changes more or less extensive were found in the spinal cord, we must mention two cases reported by Aufrecht.³ There the changes found seemed more like a localized myelitis than the changes in the cases already quoted. In the first case, in the medulla, below the olive, the central part for the distance of a quarter

¹ Eisenlohr. Ein Fall von Paralysis ascendens acuta. Virch. Arch., 1878, vol. lxxiii. p. 73.

² Schulz and Schultze. Zur Lehre von der acuten aufsteigenden Paralyse. Arch. f. Psych., 1882, vol. xii. p. 457.

³ Aufrecht. Pathol. Mittheilungen. Magdeburg, 1881.

of an inch was cloudy. Microscopically, numerous large fat-granule cells were found. In the second case, at the upper and middle third of the cervical cord over a space of about 2 mm. in length, were found several small spots, the size of the head of a pin, which upon microscopic examination was seen to be filled with granular detritus, a few red blood-corpuscles, and bodies resembling corpora amylacea.

Roussel¹ found vascular lesions in the cord, with degeneration of the ganglion cells. The peripheral nerves were not examined.

J. Hoffmann² found the membranes of the brain and cord much congested. In the medulla there was infiltration of the vessels of the meninges and nerve substance. In the corpus restiformis and pyramids there were occasionally swollen axis-cylinders. There was slight extravasation of the red corpuscles throughout the whole of the medulla. The infiltration in the cervical and dorsal cord was more marked. In the lateral columns of the cord there were small groups of swollen axis-cylinders. The same thing was true of the anterior roots. The ganglion cells were shiny and swollen, with indistinct nuclei. Small hemorrhages were seen in the cord, and particularly in the gray substance in the cervical and dorsal cord. The crural and left facial nerves were normal. The right facial nerve showed degenerated fibres. The examination of the blood for bacteria was negative.

Immermann³ reports a case in which the patient died of pneumonia four weeks after the development of the paralysis. The brain, peripheral nerves, and muscles showed nothing. The anterior horns of the lumbar, dorsal, and cervical cord showed numerous reddish spots. On examination, the vessels were found filled with red corpuscles, and granular cells infiltrated the perivascular spaces. The ganglion cells were replaced in part by hyaline masses. The white substance of the cord was not affected.

Ketli⁴ reported a case in which he saw changes in the spinal cord which were those of acute anterior poliomyelitis.

Iwanow⁵ found the vessels of the spinal cord enlarged, as well as the capillaries of the gray matter, especially in the anterior horns. There were some capillary extravasations. The walls of the vessels were infiltrated. Similar changes were seen about the central canal, where there was also a fibrinous exudation. The nerve-cells appeared cloudy and swollen, and many of the nuclei were lost. The cord was hardened in Müller's fluid. The examination of the cord for bacteria by Gram's stain resulted negatively.

¹ Roussel. *Arch. de med. nav.*, 1883, vol. xxxix. p. 370. Quoted by Bailey and Ewing.

² Hoffmann. *Ein Fall von acuter aufsteigender Paralyse*. *Arch. f. Psych.*, 1884, vol. xv. p. 140.

³ Immermann. *Ueber Poliomyelitis ant. acuta und Landry'sche Paralyse*. *Neurolog. Centralbl.*, 1885, vol. iv. p. 304.

⁴ Ketli. *Wien. med. Blatt.*, 1887, vol. x. p. 250. Quoted by Bailey and Ewing.

⁵ Iwanow. *Zwei Fälle von acuter aufsteigender Spinalparalyse*. *St. Petersburg. med. Woch.*, 1888, vol. v. p. 393.

J. J. Putman¹ also found acute hyperplastic splenitis. The peripheral nerves showed signs of neuritis, and there was infiltration of the nerve-roots. The bloodvessels were crowded with blood. The perivascular spaces and the central canal of the cord contained a "moderate number of cells." The nerve-cells were essentially normal. In the white matter of the cord an occasional enlarged axis-cylinder was seen. In the medulla the vessels were engorged, and there was infiltration of the perivascular spaces, and occasionally slight hemorrhages.

R. T. Williamson² reports a case in which the paralysis began in the right hand, extending later to the left, and then to both legs. There was no disturbance of sensation; reflexes were absent; there was rapid atrophy of the muscles. After the first ten days the patient began to improve slightly, but died suddenly from some unknown cause. In the examination of the cord, in the outer part of the anterior horns, the gray matter was found infiltrated with small round cells, and some larger cells evidently containing myelin. The bloodvessels in the neighborhood were dilated and the perivascular spaces filled with round cells. There were no real hemorrhages. The nerve-cells were shrunk and had lost their processes. There was an absence of the normal nerves seen in the anterior horns, though these were present in the other parts of the gray matter. The remainder of the cord was normal, except that the bloodvessels were dilated, and there were infiltrations about some of them. There was an atrophy of the anterior nerve-roots. The posterior nerve-roots were normal. The pia was normal except for dilatation of its vessels and occasional round-cell infiltration at the anterior part of the cord.

E. Klebs³ reported a case in which there was tubercular pericarditis from a small cheesy bronchial gland. The only change found in the nervous system was a hyaline thrombosis of the central arteries of the cord, with microscopical hemorrhages about these vessels and about most of the nerve-cells, consisting of a moderate or a greater number of round cells, with single large nuclei. Klebs ascribed this thrombosis to an acute infection.

Hlava⁴ found the brain and cord normal macroscopically. Upon microscopical examination the gray substance of the cord from the lumbar region up to the medulla, the pons, and corpora quadrigemina was the seat of small cell infiltration and hemorrhages in places. The

¹ Putman. A Case of Acute Fatal Neuritis of Infectious Origin. Boston Med. and Surg. Journ., 1889, cxx. pp. 159 and 187.

² Williamson. The Early Changes in the Spinal Cord in Acute Ant. Poliomyelitis of the Adult. Med. Chron., Manchester, 1890, vol. xii. p. 454.

³ Klebs. Ueber Landry'sche Paralyse. Deutsch. med. Woch., 1891, vol. xvii. p. 81.

⁴ Hlava. Examen histologique d'un cas ayant trait à une femme décédée sous les symptômes de la paralysie de Landry. Arch. boh. de méd., 1891, vol. iv. p. 270. Ref. in Schmidt's Jahrbuch, 1891, vol. ccxxxii. p. 244.

foci were chiefly in the anterior and posterior horns and also in Clarke's column. The white substance was intact. The vessels everywhere were dilated. In the medulla the infiltration involved chiefly the nucleus of the vagus, hypoglossus and glosso-pharyngeus, and also the olives. The sciatic and the ulnar nerves were examined. In both there were numbers of so-called mast-cells in the medullary sheath, but nowhere was there degeneration.

Zusch¹ reports a case in which a change in the color of the white substance of the cord was evident—a change which “would indicate an acute myelitic process.” The cord seems to have been examined macroscopically only. The paralysis seemed to be the sudden outcome of a very marked stage of chronic alcoholic poisoning.

E. Leyden² reports a case where the spleen was small and firm. There was broncho-pneumonia. The blood contained no bacteria. There was neuritic atrophy in the peroneal nerves, in the right radial, and in the recurrent nerves. The cord, hardened in Müller's fluid, showed some thickened and swollen nerve-fibres, with poorly-staining sheaths. These were most abundant in the lateral columns of the dorsal cord, diminishing above. Between these large fibres were small ones, which Leyden thought compressed. Deiters' cells were enlarged, swollen, with clear nuclei, but not increased in number. There were no compound granule cells. The ganglion cells of the anterior horn were swollen and cloudy, so that it was difficult to make out the nucleus, and the nerve processes were swollen. In a considerable number of these cells vacuoles were seen.

W. Oettinger and G. Marinesco³ reported a case in which the dorsal and lumbar cord was very soft, with injection of the pia; above, the cord was firmer. The medulla and brain were congested and contained small hemorrhages. The changes in the cord followed the vessels of the anterior fissure principally. The vessel-walls were infiltrated, and the vessels themselves contained thrombi. Occasionally there would be a rupture of the vessel with a small hemorrhage in the gray matter. The nerve-cells showed loss of the protoplasmic granules, rupture of the cell processes, and also true atrophy. The changes were less marked in the cervical cord, where they were practically limited to the anterior horns. The same was true of the medulla, where, however, the affection of the nerve-cells was less. Bacteria, mostly streptococci, were seen in the leucocytes and occasionally in some of the nerve-cells, and a diplococcus was also seen. No cultures were made.

¹ Zusch. Inaug. Diss. Jena, 1891. Quoted in Sajous' Annual of Universal Med. Sci., 1896, vol. ii. B. 18.

² Leyden. Ueber mult. Neuritis und acute aufsteigende Paralyse nach Influenza. Zeitschr. f. klin. Med., 1894, vol. xxiv. p. 1.

³ Oettinger and Marinesco. De l'origine infectieuse de la paralysie ascendante aiguë, etc. Sem. méd., 1895, vol. xv. p. 45.

G. Ballet and A. Dutil,¹ in their case, reported that microscopic examination of the cord stained with hæmatoxylin and eosin showed an enormous dilatation of the vessels of the cord, especially in the anterior horns. The perivascular lymph spaces were infiltrated with leucocytes, and there were occasional hemorrhages. Nissl's stain showed pronounced degeneration of the cells of the posterior horns, of the columns of Clarke, and particularly of those of the anterior horns. These changes consisted of the disappearance of the protoplasmic granules, a swelling of the cells, the separation or rupture of the processes, disappearance of the nucleus, and granular atrophy. These changes were less marked in the medulla. The peripheral nerves showed beginning degeneration. There was little change in the muscles. No bacteria were obtained from cultures, nor were they present in the sections. There was extensive fatty degeneration of the cells of the liver.

P. Marie and G. Marinesco² reported a case in which the veins of the pia of the cord were injected. On section the anterior horns were soft and injected. The medulla was more normal, but here there were very evident hemorrhages in the gray substance of the floor of the fourth ventricle and among the root-fibres of the pneumogastric, and occasionally among the hypoglossal fibres. In the brain there were slight pin-point hemorrhages in the gray matter. On microscopic examination of the cord the anterior horns were found to be made up of mononuclear leucocytes, so that the appearance was almost that of an abscess. The leucocytes were disposed chiefly about the bloodvessels. The posterior horn showed only slight infiltration and congestion of the vessels. The nerve-cells, where not completely destroyed, were swollen, and showed loss or fragmentation of the protoplasmic granules, and rupture of the processes from the cells. In the cervical region these changes were less marked, and the same was true of the medulla. A bacillus from 5μ to 12μ in length, articulated end to end, with a clear space between them, with slight enlargement of the free ends, was found in the vessels of the anterior horn, and rarely in the nerve-cells. In the lumbar region this bacillus was not found, but a much shorter organism presenting the form of a "diplo-bacterium." No cultures. No inoculations. The peripheral nerves seemed normal.

Remlinger³ reports a case in which he found dilatation and inflammation of the vessels of the anterior fissure, and particularly of the branches to the anterior horns. The leucocytes were more numerous in the vessels than normal. He speaks also of the rupture of the cell-

¹ Ballet and Dutil. *Paralysie ascendante algue symptomatique d'une myélite diffuse ascendante.* Bull. et mém. de la soc. méd. des hôp. de Paris, 1895, 3e série, vol. xli. p. 684.

² Marie and Marinesco. *Sur un cas de paralysie de Landry, etc.* Bull. et mém. de la Soc. méd. des hôp. de Paris, 1895, 3e série, vol. xli. p. 659.

³ Remlinger. *Sur un cas de maladie de Landry, etc.* Compt. rend. de la soc. de biol. Paris, 1896, 10e série, vol. lli. p. 376; also Méd. mod., Paris, 1896, vol. vii. p. 209.

processes of the ganglion cells. Nissl's method was used. In the anterior horn in spaces between the large cells, probably in the lymph spaces, he found chains of streptococci. There were no bacteria within the nerve-cells. There were no hæmatozoa in the vessels or out of them. The medulla and peripheral nerves were not examined. Pure cultures of streptococcus were obtained from the cervical, dorsal, and lumbar cord. The blood from the peripheral vessels was sterile.

P. Bailey and J. Ewing¹ in their case reported the spleen as enlarged. They found congestion of the bloodvessels of the cord, with exudative inflammation in the anterior horns of the cord and in the medulla. There were vascular and exudative changes in the motor cortex, the basal ganglia, and the cerebellum. There were degeneration of the nerve-cells and vascular changes in the nerve-roots. The peripheral nerves were not examined.

J. Eichberg² in his case found congestion of the anterior horns of the cord. There were hemorrhages into the anterior horns, and the tissues about the vessels were infiltrated with round cells. In the lumbar region the process amounted practically to an abscess. In this portion there were no ganglion cells. Higher up in the cord some of the ganglion cells remained, but were altered and surrounded by inflammatory exudation. The alterations were shown by the difference in staining with aniline blue-black, Weigert's, and other stains. There were no changes in the white matter except congestion of the vessels. The membranes of the cord were congested. The anterior nerve-roots were normal. The brain and the peripheral nerves were not examined.

Diller and Meyer³ reported a case of Landry's paralysis which was normal except that the course was somewhat prolonged (fourteen weeks). They found a diffuse atrophy in the pyramidal tracts, with hyperæmia of the crossed pyramidal tract and increase of the neuroglia. The axis-cylinders of the pyramidal fibres were slightly rarefied. In the anterior horns there was marked pigmentation of the ganglion cells. The nerve-roots were normal. The medulla, brain, and peripheral nerves were not examined.

R. Van der Velden⁴ reported a case which is not perfectly typical. In it he says that the legs were stiff, and there was a loss of the electrical excitability of the muscles. The cord showed swelling of the axis-cylinders, with loss of the myelin sheath in various small areas, chiefly

¹ Bailey and Ewing. Contribution to the Study of Acute Ascending (Landry's) Paralysis. New York Med. Journ., 1896, vol. lxiv. pp. 1 and 41.

² Eichberg. A Case of Ascending Paralysis, etc. Med. Rec., New York, 1891, vol. xxxix. p. 226.

³ Diller and Meyer. A Case of Landry's Paralysis with Autopsy. THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, 1896, p. cxi. p. 404.

⁴ Van der Velden. Ein Fall von acuter aufsteigender spinal Paralyse. Deutsch. Arch. f. klin. Med., 1877, vol. xix. p. 333.

in the anterior and lateral columns. There was also some exudation about the vessels.¹

From a cursory review of the changes found in these autopsies one would almost think that any possible change of the nervous system could cause Landry's paralysis, or no changes at all be required to produce the symptoms. It would hardly seem that it were merely accidental that so many of the cases with negative pathological examination were among the first reported. Without doubt many of these cases if examined with the present methods would have shown definite pathological processes, so that it could scarcely be maintained by any one at the present day that Westphal's criterion of a negative pathological result is necessary in this disease.

Leyden² divides Landry's paralysis into: 1. A bulbar or medullary form. 2. A neuritic form. The first, he says, is caused by a process in the cord which extends to the medulla, and is essentially a myelitic

¹ The case of Varnali, in the *Romania med. Bucuresti*, 1896, vol. iv. p. 20, has been omitted because we were unable to obtain access to the journal; the case of Bristow and Horsley, *Brit. Med. Journ.*, 1888, vol. ii. p. 1110, quoted by Ross, because it was evidently rabies.

The following cases, with autopsy, have also been omitted for various reasons—a few because the pathological examination was indefinite; most of them because the cases were not typical of Landry's paralysis.

Leyden. *Allgem. Zeitsch. f. Psych.*, 1875, vol. xxxii. p. 537. Leroy d'Etiolles, 2d part, p. 97. Quoted by Ross.

Ollivier. *Traité des maladies de la moelle épinière*, 1837, 3d ed., p. 51. Quoted by Ross.

Kussmaul. *Zwei Fälle von Paraplegie*, etc. Erlangen, 1859.

Leudet. *Paralysie ascendante aiguë*. *Gaz. des hôp.*, 1861, vol. xxxiv. p. 229.

Bablon. *Paralysie ascendante aiguë*. *Gaz. hebdom.*, 1861, 2e série, vol. i. p. 806.

Leudet. *Sur les troubles des nerfs périphériques*. *Arch. gén. de méd.*, 1865, 6e série, vol. i. p. 525.

Bourdillat. *Paralysie gén. consécutives à la rougeole*. *Gaz. des hôp.*, 1868, vol. xli. p. 5.

Chalvet. *Thèse de Paris*, 1872; also *Gaz. des hôp.*, 1871, vol. xlv. p. 369.

Duchenne. *De l'électrisation localisée*, 1872, 3d ed., p. 445. Quoted by Ross.

Gombault. *Un cas de paralysie spinal*. *Arch. de phys.*, 1873, vol. v. p. 80.

Cornil and Lepine. *Soc. de biologie*, 1873, vol. v. p. 206.

Calestri. *Gaz. Lomb.*, 1874, vol. xxxiv. p. 20; also in Schmidt's *Jahrbuch*, 1875, vol. clxviii. p. 18.

Leyden. *Ueber Poliomyelitis und Neuritis*. *Zeitschr. f. klin. Med.*, 1880, vol. i. p. 414.

Fox. *A Case of Acute Ascending Paralysis*. *Brain*, 1880, vol. ii. p. 418.

Finny. *A Case of Acute Ascending Paralysis*. *British Med. Journ.*, 1882, vol. i. p. 732.

Roth. *Neuritis disseminata acutissima*. *Correspondenzblatt für schweizer Aerzte*, 1883, vol. xiii. p. 317.

Vierordt. *Multiplen degenerativen Neuritis*. *Arch. f. Psych.*, 1883, vol. xiv. p. 678.

Wood and Dercum. *Acute Ascending or Landry's Paralysis*. *Ther. Gaz.*, Detroit, 1885, vol. ix. p. 157.

Buck. *A Case of Landry's Paralysis*. *Lancet*, 1885, vol. ii. p. 12.

Sondykin. *Arch. de Neurol.*, 1886; also in *Centralbl. f. klin. Med.*, 1887, vol. viii. p. 181.

Pitres and Vaillard. *Paralysie ascendante aiguë*. *Arch. de phys.*, 1887, 3e série, vol. ix. p. 149.

Lunz and Mamurovski. Quoted in *Neurol. Centralbl.*, 1890, vol. ix. p. 696.

Pribytkow. *Soc. of Neuropathologists and Alienists at the Moscow University*, Sept. 24, 1893. *Neurolog. Centralbl.*, 1894, vol. xiii. p. 716.

Vranjican. *Fall von acuter multipler Neuritis*. *Wien. klin. Woch.*, 1895, vol. viii. pp. 485 and 511.

Stephens. *Landry's Paralysis*, *Glasgow Med. Journ.*, 1896, vol. xlv. p. 5

² Leyden. *Zeitsch. f. klin. Med.*, 1894, vol. xxiv. p. 26; and Nothnagel's *Path. und Therap.*, 1897, vol. x. p. 445.

process. The other form he thinks is a purely neuritic one, and in this case he states that changes in the electrical reactions of the nerves and muscles often occur, so he says to the process in the second form of the disease, a polyneuritis, there is joined a parenchymatous œdematous process in the spinal cord, which extends to the medulla and, arriving in the neighborhood of the vital nerve-centres, causes death. He also calls attention to the fact that multiple neuritis in its ordinary course shows several essential differences from Landry's paralysis, and mentions the fact that it usually requires less time in which to develop, that there is but a slight tendency to spreading, and no such constant inclination to affect the medulla. He might also have called attention to the fact that multiple neuritis, when extending, is much more apt not to ascend in so regular and orderly a manner as Landry's paralysis.

Jolly¹ holds practically the same view, but thinks, in addition, that under certain circumstances the cause which produces the injury to the nerve function can act without leaving behind it demonstrable microscopical alterations.

In this connection it is well to remember that Dejerine and Sotta,² in a case of chronic polyneuritis of fourteen years' standing, demonstrated pathological changes in the cells of the anterior horn. Ballet and Dutil³ also reported a case of polyneuritis in which they found the protoplasm of the cells of the anterior horn stained by Nissl's method, homogeneous and swollen, without nuclei or processes. In others the granules were diminished in number, the nuclei were irregular in shape and often at one side of the cell, and there was loss of the nucleolus.

Landry's paralysis must, from its clinical symptoms, necessarily be an affection primarily of the motor neuron of the first order, without involvement of the sensory nervous apparatus. Inasmuch as this motor neuron is both within and without the spinal cord, it is not so strange as it seems at first sight that changes have been missed in the one place or in the other. That changes do occur in the motor cells of the anterior horn in cases of peripheral neuritis can no longer be doubted. The question which concerns us is whether a disease which is purely motor in type should be classed with the ordinary cases of peripheral neuritis in which sensation is usually affected. Certainly Leyden was justified, by the exclusive motor paralysis, the rapid course, and frequent fatal termination of this disease, in separating it from the cases of polyneuritis of more chronic course, with marked pain, sensory disturbances, tenderness of nerve-trunks, and favorable prognosis.

¹ Jolly. Berlin. klin. Wochenschr., 1894, vol. xxxi. p. 281.

² Compt. rend. de la Soc. de biol., 1896, 10e série, vol. lli. p. 193.

³ Ballet et Dutil. Sur un cas de polynévrite avec lésions médullaires. Bull. de la Soc. méd. des hôp., 1895, 3e série, vol. xli. p. 818.

That Bernhardt and Westphal were correct in their supposition that the disease is produced by an intoxication seems to be the general opinion. That the pathological changes found should vary in intensity and extent with the severity of this intoxication need not surprise us. The first of the two cases reported in this paper shows that acute ascending paralysis, the affection being practically altogether of the motor neurons, may find its cause in an inflammatory process, most marked in the anterior horns of the spinal cord, with marked changes in the axis-cylinder throughout the remainder of the course of this motor neuron. The case of Schulz and Schultze seems to occupy a middle ground between these two forms of paralysis. From Duchenne's paralysis these cases are characterized by their more rapid course, and probably also by a slighter tendency of the process to involve the posterior roots and the sensory functions of the cord; from disseminated myelitis by the small section of the cord attacked in its transverse section, and by the anterior horns being affected throughout the whole length of the cord. Clinically, the cases should differ also, as certainly the cases of Leyden and Van der Velden, which are probably of this nature, differ from the typical cases of Landry's paralysis.

Practically these cases come very near the cases of acute anterior poliomyelitis of children, differing from them in that the process is much more generalized over the motor tracks both of the cord and medulla, this latter, as is well known, being seldom affected in the infantile form. So close, indeed, is the resemblance, that Bailey and Ewing, in their paper, have included in their tables six cases reported as acute anterior poliomyelitis occurring in children, because of the extent of the paralysis and the presence of bulbar symptoms which were severe enough to cause death. Practically, one may admit that they were justified in classing these cases with the severe type of Landry's paralysis, such as theirs, that of Marie and Marinesco, that of Oettinger and Marinesco, and the first case reported in this paper. Probably the case of Eichberg also belongs here. In this severer form the process consists of a dilatation of the vessels, with round-cell infiltration of their walls, accompanied by degenerative changes of the motor cells of the anterior horn and their processes. If the pathological process is still more acute the anterior horn may almost resemble an abscess; the normal structure of the gray matter being replaced by an inflammatory product, consisting of large and small lymphoid cells, of compound granule cells (vesicular leucocytes), and the detritus of the degenerated nerve-cells and processes. At times bacteria of different varieties may be present in this inflammatory process itself. More frequently, as in the cases reported in this paper, the examination of the sections for micro-organisms and of the cultures is negative.

The second case seems at first glance to differ entirely from the class

of cases which we have just been considering. The examination of the cord by the ordinary methods shows practically no changes, and we should probably not go far wrong if we assume that this represents one of those cases which, in the earlier reports, have been described as without pathological changes. Nevertheless, upon more careful examination by means of Lenhossek's and Nissl's methods, distinct degenerative changes were found in the motor cells, as shown by the disappearance of the chromophilic granules of the protoplasm and the changes in the nucleus and nucleolus. In both cases degenerative changes were found in the axis-cylinders of the peripheral nerves. Probably in these cases we have again to do with a degenerative process confined to the motor neuron of the first order produced by an intoxication of some sort. We must admit that similar changes have been found both in the cells and in their processes, in cases which clearly belong to polyneuritis. The fact that the course of Landry's paralysis differs so markedly from an ordinary case of neuritis, that the sensory neuron is so little if at all affected, and that the tenderness of the nerve-trunks to pressure is absent or slight, seems to justify us in retaining this collection of symptoms as forming a separate disease, clinically at least.

If this conception of Landry's paralysis as a degenerative process of the peripheral motor neuron, with or without the presence of an exudative inflammatory process in the anterior horns of the cord, be correct, the absence of the reaction of degeneration in the muscles affected can only be explained by the short duration of the disease, and the same is true of the absence of atrophy; so that one is compelled to attach less importance to the absence of these symptoms than has hitherto been done, while the absence of sensory changes acquires increased importance.

Analysis of the reported cases as to the cause shows that in a great many none could be ascribed, nevertheless in a considerable number of cases acute ascending paralysis followed closely upon some infectious disease, such as smallpox, diphtheria, or typhoid. The presence of an enlarged spleen and of swelling of the mesenteric lymph glands, which is so often noted in the autopsies, confirms this view. It has been said that we may expect to find some micro-organisms present in the nervous structures, but more often it is probable that the micro-organisms producing the poison will be found in some other part of the body. Inasmuch as nerve-cells react in much the same way to various poisons, further research will probably show that in these cases micro-organisms are not always present, but that the intoxication may be produced through faulty metabolism or by the absorption of poisons from without. That toxic substances may act in a selective manner, affecting only the motor neurons, is difficult to explain, although we are not without other instances of the same action, as, for example, the almost

pure motor trouble in lead paralysis, which, in this case, as is well known, has a special predilection for the motor nerves and for those going to the extensor muscles of the forearm.

THE USE OF ANIMAL TOXINS IN THE TREATMENT OF INOPERABLE MALIGNANT TUMORS.¹

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THE CURE OF MALIGNANT DISEASE BY ACCIDENTAL ERYSIPELAS. Early in the seventeenth century, according to Fehleisen, it was known that not only malignant growths, but certain chronic ulcers, lupus and syphilitic destructive lesions, were arrested, and in some instances absolutely disappeared following an invasion of erysipelas. In modern times Billroth called attention anew to the subject, by reporting a case of inoperable sarcoma of the pharynx cured by an attack of facial erysipelas.

There has been some dispute as to the authenticity of such cases, but it must be admitted that while it is very difficult to verify at this late day the assertion that all the cases denominated true sarcoma were in reality examples of that disease, yet it is going too far to say that all of the accounts bearing upon the question are absolutely untrustworthy. Nor will it suffice to declare the occurrence of the erysipelas and the disappearance of the growths as merely coincidental. The theory of spontaneous disappearance of the growths as a coincidence in the course of or following an attack of erysipelas falls at once to the ground in the face of the fact that the spontaneous disappearance of growths which, even with the limited knowledge of pathology at the command of our predecessors, could have been mistaken for malignant disease, is absolutely unknown. Moullin,² in investigating this subject in a most conservative, painstaking, and impartial manner, was able to identify fifteen undoubted instances of sarcoma in which an attack of erysipelas occurred. Of these, in no less than nine all evidences of the growth disappeared, and in some instances no recurrence had taken place for seven years. As corroborative evidence of the influence of the erysipelas it may be said that, of the remaining six cases, five showed a decided lessening in the size of the growth.

The cases reported by Billroth,³ Busch,⁴ Biedert,⁵ Plenno,⁶ Bruns,⁷

¹ Presented at the meeting of the American Surgical Association at New Orleans, April 20, 1898.

² The Lancet, February 5, 1898.

³ Senn: The Journal of the American Medical Association, July, 1895, p. 131.

⁴ Berliner klinische Wochenschrift, 1866, No. 23.

⁵ Deutsche med. Zeitung, 1895, No. 4.

⁶ Archiv f. klin. Chirurg., 1886, Bd. xxxiv. p. 683.

⁷ Beitrage zur klin. Chirurg.

Coley,¹ Winslow,² Stein,³ Klieblatt,⁴ Fehleisen,⁵ and Wyeth,⁶ in all of which the growths were either markedly diminished in size, softened, or disappeared altogether, under the influence of the infection of erysipelas, should leave no doubt in the mind of any reasonable person that malignant disease is influenced in a remarkable manner by the presence of this disease.

Répin⁷ collected twenty-one observations of modified or cured tumors by accidentally acquired erysipelas. Among these 11 were one or another of the varieties of sarcoma, viz., 6 round-celled sarcomas; 3 lymph-sarcomas, and 2 melanotic sarcomas. Of this number 6 were permanently cured. In 11 other cases of malignant tumors the amelioration was only temporary. In 5 of these epithelioma was the disease; in 6 apparent sarcoma of diverse histological variety. A study of these reveals the fact that the effect of an erysipelas in the neighborhood of a tumor is to produce in the latter signs of necrosis; softening occurs in subcutaneous tumors, followed by a sinking away from the surface and atrophy. Pre-existing ulcerative conditions of the tumor are followed by sloughing away of portions of the growth in fragments. Some, particularly glandular growths, suppurate. In all of the eleven cases the destruction of the neoplasm was but partial and the arrest only temporary. The growth soon resumed its encroaching and progressive invasion of the surrounding tissues.

The remarkable effects of erysipelas upon malignant growths, including changes involving necrosis, atrophy, and even radical cure, have been observed even in cases in which the erysipelas has been located at a point distant from the site of the tumor.

The good effects of accidental erysipelas in this class of cases has for some time suggested the idea of bringing about this disease as a therapeutic resource. Ricord attempted to elevate it to a method in the cure of obstinate syphilides, but the use of the remedy was too dangerous to be justified in the cure of disease amenable to other treatment.

When the isolation of the microbe of erysipelas was discovered by Fehleisen, the latter sought to provoke erysipelas at will in patients the subjects of inoperable malignant tumors. It was soon shown that inoculations of pure cultures of the streptococcus erysipelatis gave results quite comparable to those following accidental erysipelas.

Fehleisen⁸ succeeded five times in producing erysipelas in subjects of malignant tumor. He obtained a cure in a case of carcinoma of the breast, and in four other cases (two sarcomas and two carcinomas) there

¹ THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, 1893, p. 487.

² London Medical Recorder, 1884.

³ Vratsch : St. Petersburg, 1882, No. 16.

⁴ Münchener med. Wochenschrift, 1890, No. 7.

⁵ Des Erysipel., Berlin, 1888.

⁶ Journal of the American Medical Association, 1894, p. 985.

⁷ Répin : Revue de Chirurgie, 1895, p. 466.

⁸ Op. cit.

was a partial necrosis, or a temporary atrophy of the tumors. The same result was obtained in a similar case in the hands of Holst.¹

Coley² succeeded in producing typical erysipelas only three times out of ten trials. One of his cases was that of a man, aged forty years, with sarcoma of the lower lumbar region and groin. The groin tumor was removed by operation, but recurred in four weeks. He was then inoculated with erysipelas, as a result of which both the tumors disappeared. Three months later, however, recurrence took place, which was followed by a second inoculation, and again the tumors disappeared. Another recurrence took place. Inoculation was again attempted and a very decided reaction followed, but erysipelas failed to appear, although the tumors decreased in size. A week later, however, a spontaneous attack of erysipelas occurred in the same region as the last, and during the three weeks following two similar attacks occurred, though milder in type.³

The first of these was a striking case of sarcoma of the tonsil and secondary involvement of the structures in the neck. The latter had been operated upon three times prior to this. Fehleisen's method of inoculation by scarification was attempted, but proved unsatisfactory, and one-half to two grammes of bouillon cultures were injected into the neck tumor, with the result that, although no attack of erysipelas occurred, and but slight reaction followed the injections, improvement followed. This, however, ceased, and the tumors began to increase in size, when the treatment was discontinued. A new and more virulent culture was obtained and a severe attack of erysipelas followed its injection. This was followed by disappearance of the tumor in the neck.⁴

The particular striking feature of these observations is the constancy of the effects produced both by Fehleisen and Coley. Whenever a decided erysipelas was produced an effect upon the tumor was observed.

In future studies of the subject it may be possible, following Neelsen, to obtain histological examinations of the growths when undergoing destructive metamorphosis.

THE USE OF THE SEPTIC PRODUCTS OF THE STREPTOCOCCUS ERYSIPELATIS. The method of direct inoculation by scarification of Fehleisen, and the injection of bouillon cultures of Coley, found very few followers, this doubtless being due to the only partial successes as well

¹ Annales de l'Institut Pasteur, 1888, p. 243.

² THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, May, 1893.

³ This case was finally treated and a permanent result obtained by the employment of the toxic products of erysipelas and bacillus prodigiosus. THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, September, 1896, p. 258.

⁴ This patient was examined in September, 1895, within a month of four years following the last inoculation, and nothing was to be seen upon the neck save the scars resulting from the former operations. The tumor of the tonsil was still present, although it had shrunk in size and lost its malignant features.

as the dread of provoking a mortal disease. The fatal cases of Janike,¹ Neelsen,² and Coley³ emphasize this. These facts, added to which was the difficulty of preserving the virulency of the streptococcus, contributed to cast discredit upon the method.

Following Brieger and Frankel's discovery, Lassar,⁴ of Berlin, in 1891, employed the toxic products of the germs alone. The method of filtration was employed to separate the germs from the toxins, after which the latter were sterilized by steam. After several injections practised on himself by his assistant, Friedlander, and also upon animals, the innocuity of the material was demonstrated when it was injected into the nodules of an epithelioma of the face which had followed lupus. Doses of 25 c.c. of the culture were employed. Toleration of the injection was reached before any favorable influence upon the growth was obtained, and the attempt was abandoned. The effect upon the neoplasm, save a trifling irritation, was absolutely *nil*. Lassar was followed by Spronck,⁵ of Utrecht, Holland, who likewise believed that sterilized cultures would attain the same end as living and virulent micro-organisms. Uncertain as to the best methods of accomplishing this end, and believing that cultures sterilized by filtration and those sterilized by heat united different properties, he employed a mixture of the two liquids. For media culture he employed the bouillon of meat, bouillons of peptonized beef, white of egg, and serum of beef. His experiments were carried on with cultures of different ages made at varying temperatures, and either in the presence of air or partially or entirely in oxygen. Five per cent. of glycerin was added to the bouillon cultures and the fluid evaporated to one-tenth of its volume. Those sterilized by heat were heated to 100° C., and those sterilized by filtration were filtered through porcelain.

Spronck carried on experiments upon animals as follows: The filtered liquid was injected into the veins of rabbits in doses of from 10 to 15 c.c. per kilogramme of the weight of the animal. Death occurred in from twenty-four to forty-eight hours. Varying effects were observed according to the virulence of the streptococcus which furnished the cultures, as well as the degree of susceptibility of the animal.

Dogs affected with tumors were treated by this method. In the case of a dog affected with a tumor the subcutaneous injection of the liquid in larger proportionate doses produced no untoward symptoms. Some redness and transient swelling took place at the point of injection, but no suppuration nor necrosis occurred. The subcutaneous injection of several c.c. produced a slight and irregular elevation of temperature.

¹ Centralblatt f. Chirurgie, 1884, p. 55.

² Loc. cit., No. 44.

³ THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, May, 1893, p. 506.

⁴ Deutsche med. Wochenschrift, 1891, No. 29.

⁵ Tumeurs malignes et maladies infectieuses, Annales de l'Institut Pasteur, 1892, p. 883.

Gradually increased doses, administered with several days between, did not produce general symptoms of poisoning.

In the case of two of the animals, repeated subcutaneous injections practised at a distance had no effect upon the tumors, as shown by an examination of the latter after removal. The tumor in one of these experiments was an epithelioma in the anal region. The other was a lipoma of the mamma.

In five other dogs the changes in the tumors were more marked. Following injections practised at a distance and in increasingly large doses the tumors took on a livid violet color, with increased heat; in two cases the growths became painful upon palpation. The injections being continued, softening and necrosis of the neoplasm began. In two cases these alterations occurred with astonishing rapidity.

Ablation of the remaining portions of the growths was then practised. Microscopic examination of these showed that the tumors had undergone localized alterations only. The histological varieties embraced two sarcomas and three epitheliomas. In isolated points fatty degeneration with islets of necrosis and infiltration of the polynuclear white blood-corpuscles was found. Cells the seat of indirect division were rare. These alterations did not differ materially from those frequently found in malignant growths.

One of the most interesting and conclusive of Spronck's observations is the following:

A large but cachectic cart-dog presented a tumor of hard consistence, and the size of a child's head, upon the right shoulder, which constituted a local recurrence of a small tumor that had been removed by operation a year previously. The exact nature of the primary growth had not been determined. Upon the fourth day of treatment a slight swelling of the tumor was noticed, together with some discoloration, and increased heat and tenderness as well. The growth softened and presented isolated fluctuating areas, with well-defined outlines. This softening process went on until at the end of three days the entire tumor was converted into a liquid mass covered by the intact skin. Incision gave exit to a puriform fluid containing the débris of the broken-down tumor and a large number of leucocytes. The animal died, and the post-mortem examination revealed only a small fragment of the tumor attached to the skin remaining. The microscopical examination of this showed the growth to be adenosarcoma.

The clinical symptoms presented by the animals as a result of the presence of the erysipelas, as detailed by Spronck, and their resemblance to those present in man as a result of the injections, are of the most indubitable character.

Twenty-five subjects with inoperable malignant tumors were treated by Spronck up to the time of his report. Unlike Lassar, he employed the injections at a distance from the tumors. Of these 8 were cases of

sarcoma, among which were 2 of melanosarcoma. The remaining 17 cases were carcinomas, viz., 6 of the breast, 1 of the parotid gland, 7 of the tongue or buccal cavity, and 3 of the skin. The injections were made in the subcutaneous cellular tissue, and by preference in the lumbar region. The culture fluid, from one to two-tenths of a cubic centimetre, was diluted with normal salt solution. The dosage was increased more or less rapidly, according to the reaction; in some instances a dose of several grammes was reached.

Following the injections, first elevation of temperature, and then other phenomena took place, these varying with the dosage. Lancinating pains took place, particularly in primary growths, but were also observed in large secondary tumors of regional recurrences, as well as in some metastatic growths. On the other hand, in small secondary growths patients did not feel the slightest sensation. In several cases these pains made themselves felt two or three hours following the injections, and disappeared on the following day. Increased sensitiveness of the growth was noted during this time. In three cases there was slight tumefaction, with heat and redness. These symptoms were more noticeably marked in the sarcomas than in the carcinomas. The most marked reaction was observed in a patient the subject of a number of metastatic tumors which developed following the extirpation of a small primary alveolar sarcoma of the skin. The injections, although carried on in small doses, were followed by swellings and softenings so intense that, under the influence of a fear excited by the first statements concerning the dangers of the use of Koch's tuberculin, the treatment was abandoned.

As to the final therapeutic results: In a majority of cases the growths were not modified. In others they seemed to yield somewhat, while in a small proportion of cases a complete arrest took place; in a small number of the latter some diminution in the volume of the tumors was noticed. In cases of multiple tumors all of the latter were not influenced to the same extent, although some disappeared completely. In no case was a patient entirely relieved of all his tumors, and in instances where amelioration was marked this proved to be only temporary; the neoplasms began to grow again in spite of a continuation of the treatment, a seeming toleration of the toxins being established.

Among the carcinomas only one, that of the breast with involvement of the axillary glands, was markedly influenced by the treatment. The glandular involvement disappeared almost completely, only to reappear.

Examination of tumors extirpated after a series of injections was made in five cases. In one case, that of a melanosarcoma, comparisons were made between tumors extirpated before commencing the treatment and their removal after a number of injections. The latter presented

marked changes, these consisting of a flabby, wrinkled appearance, and a decided tendency to greater contraction when placed in alcohol. They were likewise less rich in small cells and in mitoses than the first. In some localities the characteristic cells of sarcoma had disappeared, nothing but the connective-tissue framework of the tumor remaining, this containing pigmentary granulations and some leucocytes.

Spronck came to the conclusion, as a result of his experience, that the therapeutic action is not sufficiently demonstrated. It was shown, however, that the toxic products of *streptococcus erysipelatis* when absorbed from the subcutaneous connective tissue, both in man and in animals, lead to alterations tending to necrosis and to the absorption of the neoplasms.

Prior to this Coley had observed that even in cases in which erysipelas was not produced by attempts at inoculation, notable improvement in the growth followed the injections of bouillon cultures. This naturally suggested that the curative action might be due in whole or in part to the influence of the toxins rather than to the germ itself. If this should prove to be true, a great advance would have been made, since the treatment would be robbed of many of its dangers, and the dosage better regulated by substituting the toxins for the infecting agent itself. The advantages of a methodical treatment over a hap-hazard and dangerous experimental inoculation of a not infrequently uncontrollable disease were at once appreciated. The effects of the toxins would be under control, to some extent at least, as compared to the disastrous and untoward results of turning loose upon the patient the virulent *streptococcus erysipelatis*, with all its local and metastatic possibilities, to say nothing of the dyscrasial effects from toxins, the production and dissemination of which would be in proportion to the extent of a too often uncontrollable local environment.

Like Lassar and Spronck, Coley was doomed to disappointment. Attempts to obtain results after sterilization of the bouillon cultures by steam heat to 100° C., produced toxins too feeble in their effects for use, and filtration though the Kitasato filter still further lessened their efficiency.

Répin's¹ experiments were carried on in the service of Périer, in Paris. Cultures were obtained from two different sources, the one from a fatal case of erysipelas, 1 c.c. of the culture of which injected subcutaneously into a rabbit proved fatal. The other specimen was obtained through Marmorek from Metchnikoff's laboratory. The virulence of the latter was reinforced by being passed a number of times through rabbits until finally it killed the animal in doses of one-tenth of a drop administered subcutaneously. This virulency is only equalled by that of the bacillus

¹ Op. cit.

anthracis. The culture medium employed by Répin was a bouillon of malt peptone and the serous fluid of hydrocele. The cultures were made in vacuo, and were carried on from three weeks to a month. Some were neutralized several times in the course of the growth. The culture liquids were sterilized either by heat or filtration through porcelain. In some instances fractional sterilization was employed after filtration through porcelain.

The effects of these cultures were carefully studied by Répin. When injected into the subcutaneous cellular tissue, even in the smallest dose, a burning sensation was complained of which lasted for several hours. At the end of two or three minutes an area of erythema appeared which persisted for several days. Upon the day succeeding a small, hard nodule, varying in size from that of a pea to a cherry, was found in the œdematous area, if the fluid employed was concentrated. The margins of the erythematous area were generally diffused, although in one case where the injection was made in the thigh this was absent, with a progressive tendency to extension, thus simulating a typical erysipelas. No germs, however, were present in the fluid employed, and the same liquid was employed that had been injected both previously and subsequently upon the same patient without the occurrence of this symptom. More or less sensitiveness remained at the point of injection for a long time.

In order to diminish the latter Répin diluted the toxin and devised an apparatus whereby the diluted culture fluid was slowly introduced into the subcutaneous cellular tissue, the local action being thus distributed over a large surface. Under these conditions the erythema failed to appear, but painful and extensive œdema occurred.

Owing to the inconveniences arising from the subcutaneous method, Répin employed intravenous injections. These were not followed by any local disturbance, and at the same time a more prompt and decided as well as uniform general reaction was obtained.

The intensity of the general reaction obtained varied with the dose and the method of administration. The first noticeable symptom was a rigor. When the injection was made subcutaneously a larger quantity was required to produce the effect than when the intravenous method was adopted. Several centimetres were required in the former case, while a few drops were sufficient in the latter. The vascularity of these tumors explains the ease with which reaction can be produced by Coley's method of interstitial injection, this latter being quite analogous if not identical with the intravenous method. This rigor appears from fifteen minutes to two hours after the injection, and it rarely lasts longer than thirty to forty minutes.

The symptom of elevation of temperature likewise depended upon the dose. This followed the chill after from three to six hours, if the

latter occurred, and in some instances reached 40° C. The fever lasted from eight to ten hours. It was accompanied by the usual correspondingly increased pulse-rate and frequency of respiration.

Cephalalgia sometimes occurred, as well as some nausea and slight vertigo. Labial herpes, sweating in the palms of the hands, and fugacious erythematous eruptions were observed in some cases in which fever was well marked.

Estimates of the amount of urea showed this at times to be somewhat lessened; albumin was not found at any period.

Examinations of the blood made ten minutes after the intravenous injections showed a slight diminution in the number of leucocytes present. The subcutaneous injections were followed by no change in this respect. Leucocytosis was occasionally observed, this being more noticeable after the intravenous injections.

Emaciation supervened very rapidly upon the use of large doses. One patient lost 5 and another 5½ kilogrammes in the first week. In proportion as the treatment is pushed this becomes more pronounced. This, according to Répin, need excite no alarm, and should not constitute sufficient justification for discontinuing the treatment if the latter is found to possess a therapeutic value.

The occurrence of small abscesses at the seat of puncture occurred with no greater frequency than with ordinary hypodermic injections. Répin calls attention to a special accident, namely, collapse following a sharp chill, intense headache and cyanosis. He attributes this to the accidental puncture of a vein while employing the dosage appropriate to a subcutaneous injection, this, of course, being largely in excess of that permissible for an intravenous injection. He asserts that this was shown in one of his cases in which these symptoms followed the injection by the fact that a flow of blood followed the withdrawal of the needle. The remedy suggested by this accident is either to distribute the amount employed for a subcutaneous injection over a large area through several punctures, or, better still, to adopt the method of intravenous injection with the dose appropriate to that method.

In experimenting with heat-sterilized cultures it was found that when these were heated to 100° C. or more, the streptococcus toxin was considerably weakened. Three centimetres heated to 100° C. for ten minutes did not produce elevation of temperature above one degree, and but slight reaction. Six drops of the same liquid given by the intravenous method produced a slight rigor at the end of three-quarters of an hour and an elevation of temperature of one and a half degrees. The injection of a culture containing the micro-organisms, in which the latter had been destroyed by being subjected to a temperature of 80° C. for half an hour, did not prove more effective than the same volume of the decanted fluid.

Répin's clinical observations were made in connection with Dr. Courtin and embraced four cases, three of which were sarcomas and one a mixed tumor.

The first case, a sarcoma of the posterior thoracic wall, which had twice recurred after removal, was treated by twice-daily subcutaneous injections, commencing with ten drops and reaching 105 drops finally, made at a distance from the tumor, for three weeks. A single intravenous injection was then given. The tumor was then modified in some important particulars, but the action of the toxin seemed to cease, and no final result was obtained. The tumor increased rapidly in size and finally invaded the pleura.

The second case was that of a woman with a recurrence of a "mixed tumor" in the submaxillary region, with glandular involvement. The injections produced lancinating pains in the tumor, but no objective modifications in the latter were observed.

The third case was a round-celled sarcoma. Thirteen intravenous injections, commencing with ten drops and ending with forty drops, were given. No influence upon the tumor.

The fourth case was that of a man with an enormous sarcoma of the thoracic wall of probable periosteal origin. The case was treated by the continuous subcutaneous injection method. No alterations in the growth were noticed, and but slight reaction. This was continued for a fortnight. The patient lost 5 kilogrammes in weight. Interstitial injections in the tumor were then resorted to, but these did not prove more efficacious.

THE USE OF THE MIXED TOXINS OF THE STREPTOCOCCUS ERYSIPELATIS AND THE BACILLUS PRODIGIOSUS. It was not until the discovery of Prof. Roger, of Paris, that the addition of a non-pathogenic micro-organism, the bacillus prodigiosus, to cultures of certain pathogenic organisms greatly enhanced the virulency of the latter, that another advance was made in the treatment of inoperable malignant tumors by erysipelas and its toxic products. Among the organisms, the virulency of which was increased by the prodigiosus, was the streptococcus erysipelatis of Fehleisen. As far as could be ascertained the addition of this organism did not furnish to the cultures any specific action of its own.

Following Roger's discovery both living and sterilized cultures of the bacillus prodigiosus were employed for the purpose of inducing the development of a pathogenic micro-organism in animals relatively immune to the latter. In this connection are to be noted particularly the experiments of Vaillard,¹ Rouget,² and Roux,³ who successfully inoculated the guinea-pig with tetanus, an animal ordinarily insusceptible to

¹ Vaillard : Ann. de l'Inst. Pasteur, Paris, 1892, vi. 676-682.

² Rouget : Arch. de physiol. norm. et path., Paris, 1894, 5 S., vi. 397-411.

³ Roux : Ann. de l'Inst. Pasteur, Paris, 1893, vii. 65-140.

this disease, by combining the two organisms in the inoculation. This method apparently favors the development of the pathogenic bacillus by supplying for it a protection against the action of the phagocytes during the first few hours following the inoculation. It is claimed by Répin, however, that this action refers only to the living streptococcus and not to the toxin of the latter. He asserts that if in the hands of some observers the mixed cultures have produced a greater reaction it is because the bacillus prodigiosus itself exercises a toxic influence upon man not usually attributed to it, but that it does not necessarily follow that it exercises the same influence upon tumors as that following the reaction from the streptococcus. His method, therefore, is to employ pure cultures of the streptococcus in progressively increasing doses.

Coley, however, adopted the method of strengthening the bouillon cultures of streptococcus suggested by Roger's discovery. He very soon demonstrated its efficiency, and succeeded in obtaining more satisfactory results by mixing together the most virulent streptococcus culture obtainable with that of the prodigiosus in the proportion of four of the former to one of the latter, sterilizing the mixture by filtration and preserving it by the addition of a few crystals of thymol. Cultivation of both germs in the same fluid was subsequently resorted to, and sterilization by heating to 50° to 60° C. substituted for filtration. While this permits the germs themselves to remain in the fluid, exposure of these to the above temperature is sufficient to render them sterile. The method employed in the preparation of Coley's fluid is essentially as follows:

Sterilized peptonized bouillon is inoculated with a culture forty-eight hours old, the original source of which was a fatal case of erysipelas, and the continued virulency of which has been assured by passing it through rabbits as follows: The ear of the animal is freed from hair and sterilized by washing with weak carbolic solution, followed by sterilized water. A small quantity of bouillon culture of the germ forty-eight hours old is then injected in several places in the ear. At the end of forty-eight hours the ear is again sterilized and washed, and a culture taken by introducing a stout platinum needle beneath the skin in the infected area, when the layer of skin is cut out and lifted away with the needle. The piece of skin is then used to inoculate an agar tube. If the agar is prepared with 75 per cent. of bouillon and 25 per cent. of fresh urine the growth of the colonies of streptococci will be increased. The inoculated agar tube is then placed in an incubator. At the end of twenty-four hours colonies of streptococcus will appear upon the surface of the agar. From these colonies pure cultures of the organism are obtained to inoculate the peptonized bouillon.

The best method of making the bouillon is to employ well-chopped beef, a pound of which is to be covered with water and allowed to soak

overnight. It is then strained through a cloth and the quantity made up to 100 c.c., when it is boiled for one hour. It is again strained, and salt and peptone added, and again boiled for an hour. The fluid will now pass through filter-paper perfectly clear, and after filtering is ready for the flasks. It need not be neutralized.

The peptonized bouillon is placed in small flasks, each containing from 50 c.c. to 100 c.c., and sterilized. It is then inoculated from the colonies upon the surface of the agar tubes, and the growth of the germ carried on for three weeks at a temperature of 30° to 35° C., after which the flask is inoculated with the bacillus prodigiosus. The fluid is then exposed to room-temperature for another ten days, when, after being thoroughly shaken, the cultures are transferred to sterilized glass-stoppered bottles. Sterilization is accomplished by exposing these to a temperature of from 50° to 60° C. for an hour.

All of Coley's patients have been treated by interstitial injections into the tumor itself. This circumstance rather enhances the value of the evidence derived from these cases. While it is true that decided effects can be produced by irritating substances substituted for the toxins, such, for instance, as turpentine, as practised by Krynski, of Krakau, still the fact is settled that these are not of a curative character; further, they have no elective action upon the tumor when injected at a distance and producing the same effect, as in the case of the toxins. Once the specific action of the toxins is admitted it is highly probable that this should be exerted more energetically *in situ* than when injected at a distance.

In using the injection it is to be borne in mind that the patient may be either more than ordinarily susceptible to the action of the toxins of the germ, or he may be comparatively immune. Hence in the commencement of the treatment the dose of two minims should be employed. Dr. Coley has seen a temperature of 105° F. follow the use of this quantity. While it is true that the more decided the reaction, as shown by the temperature, the better the outlook for a favorable influence upon the disease, it is not desirable that this should exceed 103° to 104° F. This is surprisingly well borne. In several instances, in spite of great depression following excessive reaction, the patient's general condition markedly improved.

The dose of the above preparation of Coley may be carried up from a half to eight minims, according to the reaction. Glycerin or sterilized water may be used for diluting the solution. If the filtrate is used the initial dose should be double that selected when the unfiltered toxins are employed. The injections may be made in the tumor itself, although it is probably safer to inject subcutaneously at first, as a larger dose will be borne if this method is employed. The injection of the toxin solution directly into the structure of a vascular tumor leads to a more rapid

absorption, and in a very feeble person may give rise to depression so great as to prove fatal. A case is reported by Moullin, that of a feeble old man with an enormous and very vascular tumor of the femur, in whom, following a first injection with no marked result, a second injection was made in the tumor itself. The injections were made two days apart. Following the second injection a rigor occurred, followed by such extreme prostration that the patient never rallied. Moullin states that the second injection in all probability entered a vein.¹

In the absence of excessive reaction or great debility the injections may be given daily, with the expectation of obtaining two or three well-marked reactions during the week. With the occurrence of marked diminution of the growth, frequency of the injections may be diminished.

Of course, it will at once be recognized that a patient, even if not completely immune at the commencement of the treatment, may become so after the injections have been continued for a certain length of time, in spite of the addition of the bacillus prodigiosus. As a result of the experience of those who have employed the method and studied its effect, it has been found that a trial of from two to three weeks will demonstrate either that some benefit will result from its use, or that it is useless to continue the treatment longer. Where apparent benefit results from the treatment and there is no contraindication to its continuance, it may be kept up for three or four months, with occasional intervals of rest for three or four days.

In response to a letter of inquiry to Dr. Coley, I am indebted to him for the following:

“First, in regard to carcinoma, I have never advised the toxins in carcinoma except in a tentative and experimental way. My experience, based upon sixty cases, has led me to the following conclusions:

“The inhibitory action in carcinoma—including epithelioma—is in many cases very marked, as shown by cessation of growth, diminution in size, and even disappearance of small nodules. The majority of cases, however, show very little if any improvement. One case, a twice recurrent carcinoma of the breast of rapid growth, demonstrated the inhibitory action beyond question. The disease apparently disappeared. Small doses, insufficient to produce a marked reaction, were administered about twice a week almost continuously for two and one-half years, the patient gained in weight, and health was restored. At the end of two and one-half years there was a slight local return apparent in the region of the pectoral muscle. The treatment was left off for a period of five weeks during my vacation. On returning I found that a tumor, the size of a hand, had developed with enormous rapidity. In a few weeks there was evidence of recurrence in the liver and abdominal organs, and the disease advanced very rapidly, producing death in five months. The carcinomatous nature of the growth had been demonstrated by repeated microscopical examinations.

¹ Op. cit.

"The case of epithelioma of the chin and floor of the mouth, your own case, remains well, now upward of three years. The diagnosis in this case, as you will remember, was made from frozen sections, and, although the clinical evidence strongly supports the microscopical, some will undoubtedly question the diagnosis. This latter is the only case in which the disease remained in abeyance sufficiently long to classify it as a cure.

"In view of these results, as I have stated, I practically advise the treatment only in sarcoma.

"With reference to *sarcoma*, my successes thus far are briefly as follows:

"CASE I.—Spindle-celled sarcoma of the neck and tonsil, treated with the living streptococcus. Well six years.

"CASE II.—Sarcoma of the back and groin, mixed-, round-, oval-, and spindle-celled. Entire disappearance. Well for three and a quarter years, when a recurrence took place in the mesenteric glands and liver, causing death eight months later.

"CASE III.—Sarcoma of the abdomen or pelvis, spindle-celled. Entire disappearance. Perfectly healthy at present, five years later.

"CASE IV.—Round-celled sarcoma of the iliac fossa. Almost entire disappearance. Patient well one year later.

"CASE V.—Spindle-celled sarcoma of the abdominal wall. Entire disappearance. Well four and one-half years later.

"CASE VI.—Spindle-celled sarcoma of the leg and popliteal space. Entire disappearance. Well one and one-half years. Recurrence. Amputation of the thigh. Recurrence in gluteal region. Partial operation, continued treatment with toxins. Disappearance. Patient well at present, five years from the beginning of the treatment.

"CASE VII.—Spindle-celled sarcoma of the chest-wall of enormous size. Entire disappearance under three months' treatment. Patient well three years later.

"CASE VIII.—Angio-sarcoma of the breast, round-celled. Diagnosis made by Dr. Prudden. Entirely inoperable tumor reduced in size so that it was easily removed. Patient well about one year later when lost sight of. This case was treated with erysipelas and bacillus prodigiosus serum as well as with the toxins.

"CASE IX.—Recurrent spindle-celled sarcoma of the palm of the hand and wrist. Entire disappearance. Slight recurrence one and one-half years later. At present under treatment; tumor rapidly decreasing in size.

"CASE X.—Sarcoma of the anterior portion of the sacrum, probably osteosarcoma. Diagnosis—clinical—not confirmed by microscopical examination. Rapid emaciation; cachexia; loss of weight, thirty-five pounds in three months; lameness and excruciating pain made clinical diagnosis practically certain. Entire disappearance of the tumor with a return to normal weight after three months' treatment. Patient in perfect health two and three-quarters years later.

"CASE XI.—Sarcoma of the pectoral region and axilla, spindle-celled. Diagnosis confirmed by Drs. Denham, Buxton, and Welch, of Johns Hopkins Hospital. Entire disappearance from seventy-eight injections. Patient shown before the New York Surgical Society, November, 1896. Patient perfectly well two and one-half years after treatment. In this case the treatment was carried out by Dr. Storrs, of Hartford, under my direction.

"CASE XII.—Round-celled sarcoma of the mesentery involving the liver and small intestine. Clinical diagnosis made by Dr. Willy Meyer at the German Hospital and confirmed by microscopic examination by the pathologist. Patient well three years later.

"CASE XIII.—Twice recurrent round-celled sarcoma of the lip—a little girl, five years of age. Disappearance. Patient well one and one-quarter years later.

"CASE XIV.—Spindle-celled sarcoma of the abdominal wall. Entire disappearance from two months' treatment. Patient perfectly well when last seen, six months later.

"CASE XV.—Enormous chondrosarcoma of the ilium. Disappearance; restoration to health; well until seven months later, when tumor recurred and continued to grow with fatal issue ten months after.

"CASE XVI.—Three times recurrent, totally inoperable case of sarcoma of the parotid and neck. Diagnosis of spindle-celled sarcoma confirmed by microscopical examination. Entire disappearance of both tumors under three months' treatment. Patient shown before the New York Surgical Society last evening, March 24, 1894. In perfect health, without trace of disease, five months after cessation of treatment.

"I wish to merely refer to your case of probable sarcoma of the iliac fossa, the Simon boy, in which the clinical diagnosis was not confirmed by microscopical examination. The growth apparently disappeared; but about six months later a soft, fluctuating area appeared over the posterior part of the ilium, and necrosed tissue without any trace of bare bone was found on opening. Examination of the material removed was negative. He has since developed one or two areas of fluctuation further down, which seem to be either an extension of the process or are possibly due to tubercular disease. I have been unable to find any bare bone, however, and still think the diagnosis of sarcoma the more likely.¹

"In all the cases above enumerated, with two exceptions—the Simon boy and the sacrum case (Case X.)—the diagnosis was confirmed by careful microscopical examinations, and in most cases the diagnosis was made by more than one pathologist."

My own experience with the treatment by the mixed toxins is limited to the following case, although I have referred cases to Dr. Coley for treatment.

On December 12, 1895, I presented before the Brooklyn Surgical Society a patient upon whom I operated at St. Mary's Hospital, by external pharyngectomy, for the removal of a melanosarcoma of the left tonsil and fauces. A recurrence took place in four weeks and after the external wound had closed. A portion of the new growth was removed and the diagnosis confirmed by the microscope. Further operative interference was not deemed advisable, and he was placed under treatment by injections of Coley's fluid, prepared by Dr. Wilson at the Hoagland laboratory. Very decided reaction followed each injection, which was made deeply in the left arm; massage was employed after each injection, so as to disseminate the injected material rapidly. A sharp chill followed each injection, and a rise of temperature to 103° F.

¹ Since writing the above a further examination in this case confirms the original diagnosis of sarcoma.

took place. There was about one day's illness following each injection. He visited the hospital each third day, received his injection, returned home and went to bed, and upon the following day, or that intervening before the time for the next injection, he pursued his occupation as a salesman. At the end of three weeks the new growth in the lateral pharyngeal wall had disappeared, and the frequency of the injections was lessened. They were given at first every four days, and finally once a week, as a prophylactic measure, for four months. At the time of exhibiting the patient, three months after discontinuing the treatment, no trace of the disease could be found.¹

Two years afterward this patient reported himself with a recurrence of the growth. He was advised to have the toxin treatment recommenced at once, and promised to report to the hospital for that purpose. He failed to do so, however, and disappeared from my notice.

Since writing the above I have learned that this patient perished about a month ago with extensive sarcomatous infiltration of the structures of the neck on the side corresponding to the original disease of the tonsil.

C. Mansell Moullin² has employed the Coley fluid in ten cases. Two deaths followed the use of the mixed toxins. One of these, that of a very feeble old man of over seventy years, with an enormous and very vascular sarcoma of the femur, has been already referred to. The first injection was not followed by any conspicuous result; but the second, given two days later, led to a rigor which was followed by rapid and fatal prostration. The second case died of pyæmia, reference to which will be made later on.

Of the remaining eight cases one was a carcinoma of the breast and axilla, which showed no change. A second was a lymphosarcoma of the groin in a young man, who declined further treatment after one or two injections. A third was a similar growth in the neck of a man sixty-five years old, which was not affected, although the toxins were injected in considerable doses. Two other cases improved slightly, and in three cases the tumors disappeared.

In one of the cases the original tumor disappeared by sloughing after injections directly into the tumor. The woman was pregnant at the time. A recurrence in another locality subsequently took place.

In one of the cases in which the tumor disappeared and in which the treatment was begun in November, 1895, the patient was seen in March, 1896, when it was stated that there was very little of the tumor to be felt. In November, 1897, two years from the commencement of the treatment, no tumor was present, and the patient was in good health.

In another of the successful cases the treatment was commenced in November, 1896, and the patient was shown at the London Medical Society in November, 1897, one year later. The tumor, which had existed in the left loin, had disappeared.

¹ Brooklyn Medical Journal, May, 1896, p. 319.

² Op. cit.

In the third successful case the patient had a tumor of the hip of four months' duration. The swelling of the hip diminished slowly at first, and subsequently more rapidly. An abscess subsequently formed and opened spontaneously. A year later there was no recurrence.

It is to be regretted that in Moullin's three cases in which the tumors disappeared there was no microscopic examination made, and hence the proper proof that they were indubitably sarcoma is wanting. They were diagnosticated as such by others, as well as himself, and Moullin declares that if they were not sarcomas it is impossible to say what they could have been.

Dr. W. B. Johnson,¹ of Paterson, N. J., reports a case of very large spindle-celled sarcoma of the pharynx which disappeared entirely under the mixed toxin treatment, and was well when last seen, three years later. This case was seen in consultation by Dr. Coley, and the treatment was directed by the latter.

Dr. R. M. Stone,² of Omaha, reports an inoperable sarcoma of the uterus which disappeared under treatment, the patient being now well, two years later.

The principal interest in the question notably involves the application of the treatment to sarcoma, since it is now generally admitted that in a large majority of cases carcinoma will not yield in a sufficient number to warrant its employment save as a forlorn hope.

Dr. Coley has kindly placed at my disposal his statistics, which may be briefly summarized as follows:

Total number treated, 125. Of these 76 were round-celled, 17 spindle-celled, 5 mixed-celled, 8 melanotic round-celled, 2 chondrosarcoma, 11 sarcoma in which the type of cell was not given, and 6 were cases of inoperable sarcoma in which a purely clinical diagnosis was made.

An analysis of the effects of the treatment upon the different types reveals the following:

Round-celled sarcoma, 76 cases. Of these in only two did the tumors disappear under treatment. Of the remaining 74, 38 were not appreciably affected by the treatment; in 36 more or less improvement was noted.

Spindle celled sarcoma, 16 cases. Of these 9 disappeared entirely; in the remaining 7 marked improvement was manifested. In not a single case of this type of the disease was there failure to bring about marked changes in the growth.

Mixed-celled sarcoma, 5 cases. In one case in this group the growth disappeared entirely, remained away for three and one-quarter years, and then recurred; 3 of the cases were improved, and 1 was unimproved.

¹ New York Medical Record, November, 1894, p. 616.

² Loc. cit., November 20, 1896, p. 746.

Melanotic sarcoma, 8 cases. Two cases of this group showed slight improvement, while the remaining 6 were unaffected by the treatment.

Chondrosarcoma, 2 cases. One of these, a very large growth, disappeared and recurred at the end of seven months. The other was slightly improved.

Sarcoma (type of cell unknown). Of these 1 case disappeared entirely; 5 were improved, and 5 were unimproved.

In addition to those cases in which a microscopical diagnosis was made the 6 cases of inoperable sarcoma in which a clinical diagnosis was made should be taken into account. Of these 2 were cases of osteosarcoma, in one of which the tumor disappeared; in the other improvement was noted. In the remaining 4 cases the growths sprang from the soft parts; 2 of these were improved, and in 2 cases no improvement was apparent.

In the grand summary it may be stated that in 16 cases the tumors disappeared entirely, and that in but one of these was the crucial test of a microscopical diagnosis wanting.

Of the 16 cases, 14 have been traced, with the following result:

Spindle celled Sarcoma. Nine of the fourteen cases were of this type. A study of the after-history of these reveals the following: One case remains well after eight years. This case was treated with living cultures of the streptococcus erysipelatis. One case remains well at the end of four years. One case is well after three and one-half years. One case is still free from the disease after two years and ten months. One case remains well after one and one-quarter years. One case relapsed in eight months and again disappeared under treatment. One case recurred in six months and again disappeared under treatment. One case is well at the end of five months.

Mixed-celled Sarcoma. In the only case of this type in which the tumor disappeared the patient remained well for three and one-half years. She then suffered a recurrence in the abdomen, of which she died in April, 1897.

Chondrosarcoma. But one case of this type occurred in the 16 cases included among those in which the tumor disappeared. Recurrence took place in seven months.

Osteosarcoma, 1 case. This is the only case of sarcoma in the list in which a microscopical diagnosis was not made. Clinically it was a case of inoperable sarcoma of the sacrum. The patient continues well after two years.

Round-celled sarcoma, 2 cases. One case remains well two and one-half years after the disappearance of the tumor. The remaining case was well when last heard from, three months after the treatment.

It will be noted that not all of the cases of carcinoma in which the treatment by the mixed toxins has been tried have proved absolute

failures in Dr. Coley's hands. In my own case, that of an inoperable epithelioma of the chin and floor of the mouth, referred by myself to Dr. Coley for treatment, the patient remains well three years since the beginning of the treatment. In a second case, that of an epithelioma of the face, the disease disappeared, but recurred within a year. A third case was one of recurrent carcinoma of the breast, which with constant treatment for two and one-half years, remained free from evidences of the disease.

Since the preparation of the above Dr. Coley informs me that he has treated fifteen additional cases of sarcoma with the mixed toxins, with one entire success, and one case in which the tumor almost entirely disappeared. This makes a total of 140 cases of sarcoma, in 17 of which there was a complete disappearance of the growth. Of the cases which have not relapsed 1 has exceeded the four-year limit; 1 has exceeded the three-year limit, and 2 have exceeded the two-year limit. In addition to this 1 has passed the year limit, with no sign of recurrence, and is still under observation, with no recurrence, and 2 are respectively two and five months each free from recurrence after cessation of the treatment.

Of those that recurred, the longest time that the patient was free from the disease was three and one-quarter years, when a recurrence in the abdomen resulted fatally. The shortest time that the patient remained well after complete disappearance was six months. In one case of recurrence the tumors disappeared a second time under the toxins.

In one of Coley's cases, that of a round-celled angiosarcoma of the mamma, the tumor was so greatly reduced in size that it became an operable case and was extirpated. The patient was lost sight of at the end of six months, at which time no recurrence had taken place. It should be stated in this connection that the case was treated with the *erysipelas-prodigiosus serum*.

Of twenty-six cases treated by other surgeons by Coley's fluid, collected and studied by him, the following is a brief summary:

Spindle-celled sarcoma, 6 cases. Of these 5 disappeared and 1 was improved.

Round-celled sarcoma, 9 cases. Of these 7 disappeared and 2 were improved.

Sarcoma; type not mentioned, but diagnosis confirmed by microscopical examination, 5 cases; 3 disappeared.

Sarcoma; clinical diagnosis alone. Two disappeared and 2 were improved.

Of the above cases one is known to be well more than three years, one more than two years, and one is still free from the disease at one and one-half years.

DANGERS OF THE TREATMENT. The dangers arising from the super-vention of an accidental attack of erysipelas, the inoculation of a patient directly from a case of the disease, or with living cultures of the streptococcus erysipelatis, need not detain us at this time. The risks attending these methods are essentially those incident to erysipelas itself occurring in a patient the subject of a malignant disease, and whose vital powers are already taxed to the utmost in maintaining an unequal combat against local extension and general invasion. Since these procedures have been practically abandoned for the less uncertain methods involving the use of toxins in either pure cultures of the erysipelas germ or mixed cultures of this with the bacillus prodigiosus, our attention may be most profitably turned to the latter.

First, it should be borne in mind that the reaction depends upon the dosage of the toxins. Unlike most other therapeutic agents animal toxins vary very greatly in their effects upon different individuals, so much so that it becomes necessary to establish the dose in each case by commencing with the minimum amount that experience has shown will produce an effect in those the most susceptible. In this manner safety within certain limits is assured, although a greater expenditure of time is necessary in bringing the patient under the full influence of these agents.

In the employment of the mixed toxins, according to Coley's experience, it is better to commence with a dose as small as one-quarter of a minim, increasing this at each administration until the effects of the toxins are assured. Profound depression is not desirable, nor need this occur, save under the exceptional circumstances of a patient so near to death that no treatment whatever should be employed. To give an initial dose under these circumstances that would produce any reaction whatever would be to invite collapse. This was evidently the condition present in one of Moullin's fatal cases previously mentioned, a very feeble man of seventy years, with an enormous and very vascular sarcoma of the thigh.

This latter condition may likewise be brought about in those not too far gone in an over-anxiety to hurry the treatment by using too large a dose to commence with. In all the reported cases of alarming collapse following very severe reaction a larger dose than that mentioned was employed. This includes Répin's case, as well as that of Johnson. It would be just as rational to discard the use of any therapeutic remedy for the sole reason that in some instances it had been employed in unnecessarily large or too frequent doses.

There is one possible danger pointed out by Moullin,¹ suggested by an experience in the use of toxins in a case of breaking-down sarcoma with necrosis of bone and suppuration, in which death resulted from

pyæmia. The syringe was carefully sterilized and the injected fluid was likewise shown to be sterile. In addition to this the fluid from the same bottle was used upon the same day in another patient. The explanation offered by Moullin seems rational. It is that the use of the bacillus prodigiosus in a case in which suppuration was present either destroyed the immunity which the patient had acquired to the pyogenic organisms, or increased the virulency of the latter, or both, properties the possession of which led Coley to add it to the streptococcus toxin in order to enhance the effect of the latter.

A similar experience occurred to Mr. Marmaduke Shield.¹ In the last-mentioned case the patient had been operated upon for a rapidly growing myeloid sarcoma of the left breast. A recurrence in the axilla and beneath the clavicle, as well as in the scar of the original wound, had taken place. One of two growths in the scar was on the point of breaking down. The patient's general health and nutrition were good. Eight injections, with gradual increase in the dose, were given, but a week was allowed to elapse between the first five and the remaining three. The autopsy showed infarcts and abscesses in the liver, myocardium, kidneys, and right knee-joint, together with a purulent infiltration of the muscles of the thoracic wall beneath the site of the two nodules in the scar, which had disappeared under the treatment. A bacteriological examination showed the presence of the staphylococcus aureus in the secondary abscesses. In this, as in Moullin's case, proper aseptic precautions were taken in making the injections; the fluid employed was found to be sterile, and injections had been made upon another patient from the same bottle with little or no reaction.

These experiences would seem to indicate the necessity for a careful selection of cases with the view of eliminating those in which suppurative processes are in progress.

THE QUESTION OF HABITUATION. In this connection the researches of Marmoreck should be borne in mind. These consisted in the employment of injections of increasing doses of streptococcus toxin into animals with a view of finally rendering the latter immune, to the end that a serum might be obtained from the immunized animal to be employed in the treatment of streptococcus infection.

There can be no question that the general effects of the toxins become rapidly less pronounced in the course of the treatment, as immunization becomes established. While early in the treatment a comparatively small dose of the toxin is sufficient to produce a decided rise of temperature, this in some instances has been increased, after a few injections, to double, and upon occasion to quadruple, the original dose in order to obtain the same effect.

¹ British Medical Journal, January, 1897.

Inasmuch as the local action upon the tumors follows a course parallel with the intensity of the general reaction, it necessarily follows that as immunization is established the effect upon the growth becomes less and less marked, until at last this becomes *nil*, and the neoplasm, released from the restraint exercised upon it by the toxins, resumes its former progressive march. Thus it is not infrequently observed that a tumor which shows marked modifications in connection with an intense and high grade of general reaction may, as immunization becomes established and the former ceases to be manifested, fail to show signs of amelioration, in a short time giving decided evidences of increasing growth. It is the unfortunate existence of a previous immunization, either natural or acquired, in individual cases that leads to lack of uniformity in effects in the commencement of the treatment. Upon the same theory is likewise to be explained the fact that some cases that give promise of a happy issue in the commencement of the treatment come to a standstill, and finally become the subjects of a recrudescence. It is this immunization which limits the efficacy of the treatment of malignant tumors by the streptococcus erysipelatis. On the other hand, there are subjects who either do not become immune at all or do so with great difficulty. In this manner are to be explained the lasting cures that have been recorded as resulting from a prolonged course of treatment.

THE CONDITION OF THE TUMORS UNDER THE INFLUENCE OF THE ERYSIPELAS. Observations bearing upon this point are yet insufficient in number to form a basis upon which to build up a rational theory as to the *modus operandi* of the process of absorption or other means through which the disappearance of the tumors is brought about. In the only fatal case of sarcoma, that of Busch, in which a post-mortem examination following death from accidental erysipelas, in the course of which the tumor was disappearing, was made, the streptococcus was present, as was to have been expected. All that remained of the structure of the tumor at its central portion, where the changes were most marked, was represented by connective tissue, which contained in its interstices a large amount of yellowish fluid. The characteristic sarcoma cells were absent, having probably undergone fatty degeneration, and their place was supplied by this yellowish-white, opaque fluid, which contained a number of fat granules. In the outlying parts of the growth, areas still unaffected by the changes going on in the central portion could be distinguished, and served well for purposes of comparison, as well as to identify the nature of the growth.

Of the cases of carcinoma examined after death from erysipelas one is that of Neelsen.¹ Here the anatomical modifications brought about

¹ Centralblatt für Chirurg., 1884, No. 44.

by an attack of erysipelas in a carcinoma of the mamma were the subject of histological investigation. The patient died from the excessive febrile movement. At the post-mortem it was found that the tumor was partially destroyed. In certain places the epithelial alveoli had undergone fatty degeneration. In other places necrosis had taken place, leaving only débris. The walls of the empty alveoli were crowded together in spots by a new and abundant proliferation of young epithelial cells. The latter extended also into the regions adjacent to the tumor, and especially into the skin. It is to be regretted that in this connection Neelsen did not make a bacteriological investigation.

Janike's case was also one of carcinoma. Here particular attention was paid by Neisser, who made the examination, to the invasion of the streptococci. The micro-organisms were found between the cell-nests, and surrounding the latter, although actual penetration of the cells themselves was not demonstrated. With the exception that the latter were paler and less distinct, suggestive of a commencing coagulation necrosis, the carcinomatous cells showed but little change. Certainly no evidences of inflammatory change were observed.

On the other hand, in Shields' fatal case,¹ the statement is made that the well-marked effect upon two of the tumors, and which led to their disappearance, seemed to be due to a purely inflammatory action in a soft neoplasm. It should be noted, however, in this connection that a suppurative process was present, and that the post-mortem likewise revealed a purulent infiltration of the thoracic wall beneath the site of the two nodules which had disappeared.

Spronck, in the course of his experiments upon dogs, found fatty degeneration to be present in tumors removed from animals while under treatment with erysipelas toxins.

So far as our present knowledge of the processes by means of which malignant tumors disappear under the influence of erysipelas extends, these include (1) sloughing *en masse*; (2) a rapidly destructive degenerative process, comparable, as observed by Moullin, to acute yellow atrophy of the liver, and which, for want of a better name, may be called fatty degeneration. These processes are known to have occurred in malignant growths of connective-tissue origin, or, in other words, the sarcomata. It has been suggested that these two processes depend, the first upon the presence of pyogenic organisms, such as are present in growths already breaking down, or under circumstances where these can give access to the growth, as through an accidental abrasion; and the second upon the absence of these micro-organisms. The first is of the nature of a septic while the second is an aseptic process. In the presence of the former the inflammatory changes with sloughing of the growth in whole or in

¹ Op. cit.

part constitute the prominent features, while in the latter, although there may be some redness about the tumor at first, and some increase in size as well, softening occurs, the color fades out, and the surfaces flatten; in some instances a hollow may be left at the former site of the tumor.

On the other hand, the changes observed in carcinoma differ somewhat from the foregoing in degree, although the same process of fatty degeneration seemed to be present in Neelsen's case, according to his description of the histological findings. In addition, however, there appeared a new cell-growth, the exact relation of which to the destructive process does not seem apparent. In Neisser's examination of Janike's case the former came to the conclusion that a partial destruction of the cell nests of carcinomatous tissue resulted from the invasion of the streptococci, this being not necessarily accompanied by an inflammatory process. It is possible that the conditions observed by Neelsen and those found by Neisser were but different stages of the same process, and that the incompleteness of the latter, as well as the presence of the new formation tissue in the former, explains the differences in the behavior of the two varieties of malignant growth under discussion, in the presence of erysipelas or its toxins, the one furnishing the most frequent successes, the other the most frequent failures of the treatment.

THE RATIONALE OF THE ACTION OF THE STREPTOCOCCUS ERYSIPELATIS AND ITS TOXIN. The consideration of the rationale of the action of the streptococcus erysipelas and its toxin upon the life-history of malignant tumors constitutes the most important as well as the most obscure portion of the subject. Among the older observers who noted the curative action of accidental erysipelas, the prevalent theory, unsatisfactory as it appears to us at the present day, was that the superadded disease exercised a special or superactive function which accompanied the convalescence of acute febrile diseases. This, however, in no measure explains the elective action of this disease for malignant neoplasms, nor why curative influences exerted over the latter were reserved almost exclusively for erysipelas.

In the first contributions upon the subject, and before the fact that the toxins exercised a decided influence upon the growths without the presence of the germs, it was believed that the coccus excited a direct destructive action upon the cells of the neoplasm. In the light of later development this theory is no longer tenable, even though it might have been worthy of consideration in the past. Certainly it was not sufficient to account for all the phenomena in the different cases.

Another theory of the rationale of the cure relates to the occurrence of the high temperature resulting from the treatment, and the influence which this exerts over the vitality of the cells. Bruns was inclined to this view; but it is difficult to understand why conditions unfavorable to cell-life created by the fever of erysipelas should differ in any respect

from those arising from fever the result of other diseases. A number of conditions involving the febrile state are now known to depend upon specific organisms, to say nothing of septo-pyæmic conditions occurring in the history of the tumors themselves involving high temperature; it is yet to be shown that these have any influence upon the growth of tumors. As a matter of fact, it is the common experience that general infection, including fever, and excessive malignancy of the breaking-down growths, go hand in hand.

The supposed parasitic origin of cancer has given rise to the theory that the modifying influence of the erysipelas germ is a result of a direct antagonistic effect upon the micro-organisms of the neoplasms.¹

The exact manner in which this antagonistic bacterial action is exercised is not, however, made clear, although, according to its author, if we accept the micro-parasitic origin of malignant tumors, an explanation of the action is not difficult, and example and analogy are drawn from the well-known fact that "a small quantity of blood-serum of an animal rendered immune to tetanus is capable of destroying or rendering inert the virulent bacilli in a fresh case." In the present state of knowledge regarding susceptibility and immunity, this analogy cannot hold good, for the reason that in the one case the effects depend upon the introduction of an immunizing principle, secured through the influence of a toxic agent, or, in other words, an antitoxin, while in the other the toxic principle itself is introduced, and with the end only too frequently of producing an undesirable immunization instead of a persistence of the toxic effects, upon which the amelioration apparently depends. If immunization plays any rôle whatever, it must almost of necessity either result from the effects of the streptococcus or its toxins in securing immunity against its own products or those of the parasites of the growth, or both. That the former is true is shown by Marmorek's work; that the latter is possible cannot be denied. Neither, however, can satisfactorily explain the local effects upon the tumors, even though they could be brought to suggest a reason for an inhibition of growth on the part of the latter or the prevention of a recurrence after removal.

While the ground taken by Coley cannot be considered as absolutely untenable, the fact that parasitic origin of cancer is considered as being largely hypothetical at this time, on the one hand, and, on the other, the absence of uniformity of results, such as have been obtained experimentally in tetanus and clinically in diphtheria, must of themselves militate largely against it, even though theoretical considerations be left out of the question. To this is to be added the fact that in the class of cases under consideration, the toxins, so far as their immunizing effect

¹ Coley: *Annals of Surgery*, vol. xiv. p. 217. *THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES*, May, 1893, p. 500; July, 1894, p. 62; September, 1886, p. 279.

is concerned, always act slowly, and with the necessity of increasingly large doses in order to produce a repetition of a primary intense effect. On the contrary, their toxic effect, both general and local, is immediate and *pari passu* with the constitutional disturbances; the tumor softens and shows other evidences of necrobiosis in from twenty-four to forty-eight hours. Further, the primary maximum effect is reached at once, is short in its duration, and is frequently difficult of reproduction after it has subsided. Finally, with the immunization to the streptococcus itself comes a cessation of immunization to the micro-organism of cancer, if such exists, since a renewal of the growth of the latter, if it has not disappeared, as a rule, follows very quickly. This peculiar circumstance of a cessation of one property of immunization coincidently with the development of another has probably no analogue in bacteriological experience, although a number of examples of both micro-organisms and toxins are known, which produce immunization against themselves as well as against other micro-organisms and toxins.

According to the view of Répin, an elective intoxication of the cells of the neoplastic tissue occurs. It must be confessed that the processes of fatty degeneration, necrosis, and finally the resorption and elimination of the necrotic elements, lesions histologically observed, more closely approximate to results that may be supposed to follow a direct toxic effect upon the cells, than to the hypothesis of the action of one parasite upon another. The clinical evidence likewise favors this view. In all cases of cure or amelioration the effects of the erysipelas or its products have assumed a hypertoxic form: the more pronounced the so-called reaction the greater the hope of success of the treatment. Failure to effect reaction signifies that no effect upon the tumor is to be expected, and inability to reproduce successively the symptoms of intoxication is followed by recrudescence, in which all the previous characteristics of the growth are restored.

Répin emphasizes the view of cell intoxication by calling attention to the analogous action of tuberculin, the use of which is followed by a limitation of the characteristic action on tuberculous tissues as far as producing necrosis and the elimination of this tissue is concerned.

The elective action of certain medicinal agents and the mild or excessive toxicity of these in proportion to the dosage and toleration established to certain tissues, constitute an example of elective cell intoxication. This affinity of tuberculin for tuberculous tissue is explained by the fact that the cells of the latter acquire a susceptibility for the products of the tubercle bacillus from having been in permanent contact with the latter. The fact is also to be recalled that when a person is bitten a second time by a venomous serpent, even after several years following the first infection, the scar of the former wound presents evidences of irritation, as if the cells which were affected by the venom

retained for a long time a special susceptibility in this respect. A similar experience attended the treatment of a case of sarcoma of the tonsil by the venom of the cobra capello (Répin). The effects of the streptococcus in producing emaciation, with destruction of the red blood-corpuscles and increase of the leucocytes, are also duplicated in the case of some of those agents when pushed to the extent of producing a local action, as, for instance, in the case of arsenic when this remedy is administered to the extent of obtaining amelioration in cases of lymphosarcoma and lymphadenoma. Further, with interruption of the treatment the symptoms of chronic poisoning subside, the general health is restored, while at the same time the tumors take up their original growth.

Further, it should be borne in mind that the locus minoris resistentiæ incident to all local diseased conditions must play a part in the alterations manifested by the effects of all remedies. In order to establish an elective action the previous presence in diseased structures of parasitic organisms or their impregnation by specific poisons is not necessary. The fact that large tumors and those that existed for a longer time, and even those in process of breaking down, yield more readily than those smaller in size and of more recent growth, suggests that the cells of the former, from their great age, possess a lower vital resistance, and hence break down more readily under the influence of the intoxication than those of more recent origin. The youngest cells of the neoplasm in all probability escape the influence of the poison during the susceptible period and prior to failure to obtain reaction. The tumor is thus only partially destroyed and increases rapidly in size. This constitutes the weak point in the method.

Finally, it must be acknowledged that these reflections upon the influences exercised by the establishing of a locus minoris resistentiæ hold good to a greater or lesser extent, and in a variable manner, in their relation to direct destructive action upon the cells of the new growth by the streptococcus erysipelatis, the effects of high temperature, antagonistic bacterial action, as well as elective toxic influences.

TREATMENT WITH THE TOXIC BLOOD-SERUM OF ANIMALS INFECTED WITH STREPTOCOCCUS ERYSIPELATIS. In this method of toxitherapy the toxin is produced from the blood of an infected animal instead of from a bouillon culture. Répin claims to have employed toxins derived from the blood of rabbits killed by inoculation by the streptococcus. The first published account of this method is by Emmerich.¹ His method consists in inoculating a sheep with a virulent streptococcus and bleeding it just before its death. The serum obtained is first filtered and then injected into the tumors. The injection is followed by a pseudo-erysipelas at the point of inoculation with elevation of temperature.

¹ Deutsche medicinische Woch., April 25, 1895.

Six cases, in which an appreciable effect upon the tumor was obtained, were treated by Emmerich, as follows :

CASE I.—Recurrent carcinoma of the breast in a patient fifty-four years old : recurrence at site of scar and in the axilla ; induration of pectoral muscle and subclavicular fossa. Right arm œdematous and useless. Injections of 0.5 c.c. of the serum in the course of two days ; tumor diminished in size fully one-half. Dose increased so that at the end of the third day the patient had received 2 c.c., when the tumor, as well as the infiltration of the pectoral, disappeared entirely. In the mean while the axillary involvement suppurated and was incised. The treatment was continued in diminished doses for twenty-five days in all, when all traces of the recurrence had disappeared. At the end of this time there occurred a pathological fracture of the clavicle, which, however, united. At the end of nine weeks the patient was dismissed in good health, and with the function of the arm restored.

CASE II.—Recurrent carcinoma of the breast ; tumor size of hen's egg at the cicatrix, and three small scattered cutaneous nodules : daily injections of from 3 to 5 c.c. were made for a week into the principal tumor, without any effect upon the tumor injected, but the outlying nodules disappeared under the treatment.

CASE III.—Recurrent carcinoma of the breast, with metastasis in the liver and pleura : after ten days of treatment and the injection of 30 c.c. of the serum, one small nodule, the size of a cherry, had disappeared, and no further effect was obtained. The treatment was abandoned.

CASE IV.—Relapsing carcinoma of breast with cutaneous nodule in axilla : after fourteen days' treatment and the injection of 20 c.c. of serum, the cutaneous nodule was resorbed. Patient still under treatment.

CASE V.—Large carcinoma of breast with extensive axillary glandular involvement : 60 c.c. injected into the tumor and into the glands in the course of sixteen days ; the glands diminished in size fully one-half ; the effect upon the tumor was not so marked, this diminishing in size but slightly. The use of the serum was discontinued.

CASE VI.—Ulcerating cancrioid of the external palpebral commissure in a woman of sixty-five years : local injections of the serum ; growth disappeared and cicatrizing ulceration took its place.

THE USE OF THE VENOM OF THE COBRA CAPELLO. It has long been known that the venom of the cobra capello produces remarkable modifications in the nutrition of the parts bitten, such, for instance, as the atrophy of a member. Cures of leprosy and elephantiasis are also alleged to have followed inoculation with this poison ; in some instances the victims of these diseases having purposely exposed themselves to being bitten in the hope of cure. The attempt to derive therapeutic action from this source is said to be devoid of danger if proper precautions are taken. These latter consist of the employment of a minute dose at the commencement, habituation becoming established by the steady increase in the size of the dose. Calmette was the first to succeed in the methodical immunization of animals, and the production of an antivenomous serum.

The dry venom of the cobra capello was employed by Répin in doses of one-fortieth of a milligramme, injected beneath the skin in the pectoral region in a case of sarcoma of the tonsil. The size of the dose was gradually increased so that in the course of a fortnight a dose of 7 milligrammes was reached. No febrile reaction occurred. The weight of the patient increased 2 kilogrammes during that period. These injections produced painful sensations in the tumor similar to those following the streptococcus toxin. No objective alterations in the growth were noted. When the dose was increased rather abruptly it was observed that the seat of preceding injections, which had long ceased to be painful, even upon pressure, again became as painful as they were upon the day when the injection was made.

THE INFLUENCE OF ARTIFICIALLY PRODUCED SUPPURATION UPON MALIGNANT GROWTHS. The subject of the induction of nutritive changes by artificially produced suppuration in malignant disease, with the view of influencing these favorably, has received some attention at the hands of experimental observers. Krynski, of Krakau,¹ endeavored to demonstrate the influence of artificially provoked aseptic suppuration upon the course of malignant neoplasms. He was induced to make these experiments by the occurrence of a case of malignant goitre, a portion only of which was removed to relieve pressure upon the trachea and impending suffocation. Owing to the necessity for reopening the wound, on account of subsequent hemorrhage, an abundant suppuration followed and continued for several weeks. During this time the greater portion of the remainder of the growth was cast off, healing finally taking place with a small nodule still existing and marking the site of the formerly existing extensive growth. The patient left the clinic, and with the latter exception was apparently well, but was known to have perished from the disease three months later. Upon the basis of this experience Krynski resolved to ascertain whether or not suppurative change of an aseptic character, with its comparative absence of danger, would, when artificially produced, favorably influence the growth of malignant disease. In two cases of advanced carcinoma of the breast in which trial was made of the injection of oil of turpentine, for the purpose of inducing aseptic suppuration, no result was obtained save the infliction of considerable suffering upon the patients. Although necrotic tissue was thrown off from the diseased area when suppuration was well established, the disease continued to make steady advance in the neighboring structures.

On the other hand, Wyeth² records an instance of a growth in the abdominal wall in a patient, thirty-three years old, which was apparently cured by a suppurative inflammatory process. A large portion of the tumor was removed by operation and pronounced by Prof. Welch,

¹ *Centralblatt für Chirurgie*, 1895, No. 30, pp. 697-99.

² *Journal of the American Medical Association*, June 30, 1894, p. 985.

now of Johns Hopkins University, as well as by Dr. William L. Wardwell, as sarcoma. It was found impossible to remove the entire growth, and the wound made was tamponed and the operation abandoned. Arsenous acid was subsequently injected into isolated areas in the remaining portion of the growth with the view of obtaining some specific action from this agent. Before all portions of the growth had been subjected to this treatment a violent suppurative inflammatory action occurred, and the treatment was abandoned. No hope was entertained of his recovery. The process of suppuration continued for several weeks, when it gradually ceased, the tumor finally disappearing. Ten years afterward he was known to be free from a recurrence of the disease. In commenting upon the case, Dr. Wyeth states that there was no erysipelas present, and that the case was positively one of sarcoma cured by the action of other septic or toxic agents of inflammation.

THE RÖNTGEN RAYS IN OPHTHALMIC SURGERY.

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THE value of the Röntgen rays as a means of determining the presence of pieces of metal in the eyeball has been conclusively shown by the experiments of a number of investigators, the earliest workers in this field being Dr. Clark, of Columbus, Dr. Williams, of Boston, and Dr. Max J. Stern, of this city. The knowledge that a foreign body is in the eye, however, is not all the information required by the surgeon who operates with the electro-magnet for its removal. Without some indication of the position of the body, it is not possible to reduce the percentage of failures of the magnet operation. The ordinary radiograph does not accurately indicate the position of the shadow of the foreign body on the plate in relation to the shadows of the bones of the head. Hence, it is desirable to state the exact spot at which to insert the magnet with the least injury to the structures of the eye.

The first attempt to determine the approximate location of foreign bodies in the eye by means of metal indicators placed without the ball was made by Dr. H. Lewkowitch, and reported in the London *Lancet* for August 15, 1896. In these experiments, which were made upon sheep's eyes and the doctor's own eyes, the indicator consisted of a piece of wire placed in front of the eye, one of the arms of the apparatus pointing to the centre of the cornea. Only the anterior portion of the eyeball was included in the radiograph, the eye being rotated inward or outward to include a larger part of the globe. The determination of the position of the foreign body was then made by a triangulation of

two shadows on the plate cast by the foreign body, by moving the tube a known distance from the first position in making the second exposure. The photographic plate was placed at the inner canthus. In addition to these complications, and the liability of error in determining the angles of the tube in its two positions with the plate and the foreign body, the method is open to the objection that only a small portion of the eyeball is included in the radiograph.

In my early experiments with pigs' eyes placed in the ordinary Viennese mask, it was found that unless the rays were passed through some portion of the bony walls of the orbit, foreign bodies in the posterior portion of the vitreous chamber could not be shown.

In the first experiments which I made upon the human subject the photographic plate was inserted at the inner canthus. Photographic films were used, as being more readily cut to the shape desired. Each plate-holder carried two films, and two negatives were thereby secured at each exposure, thus avoiding errors arising from imperfections in the film coating.

The indicating apparatus consisted of an aluminum frame carrying three steel rods, each with a rounded end. The rounded extremities were adjusted to the inner and outer canthus and to the eyeball at the centre of the upper lid. Two exposures were made, one with the Crookes tube on a line with the inner and outer indicators, and the other below the horizontal plane of these indicators. In determining the position of the foreign body in the eye, the apparatus was attached to a fixed support, and a lighted candle employed to cast the shadows of the indicators on a cardboard similarly to those made on the negatives by the x-rays. A small object was then held in such a position that its shadow was identical to that of the foreign body. The candle was moved until the shadows of the indicators corresponded to those on the second negative. The crossing of the two lines of shadow of the test-object represented the situation of the foreign body.

This method of marking was first employed in the case of a young man with a piece of steel in the lens, sent to me by Dr. A. G. Thomson. From a number of negatives I located the body 7 mm. behind the centre of the cornea, and about a millimetre to the nasal side. Dr. William Thomson subsequently removed the soft and opaque lens with the piece of steel imbedded in it.

While the use of the photographic plate at the inner canthus has the advantage of bringing the sensitive film much closer to the eyeball than when in any other position, an important consideration when dealing with very small objects, it has the objection that the whole eyeball is not included on the plate. For this reason, and also because of the imperfect coating of the celluloid films, I have since used glass plates bandaged to the temple. Instead of three indicators, two only are now used.

The principle of employing two objects of known position to locate the situation of a third object from the shadows cast by these objects upon a flat surface is extremely simple. For all practical purposes we may regard the rays from a Crookes tube, at least thirteen inches away, as being parallel in passing through a body so small as the eye. Therefore, if the relative position of two objects is known, we can readily determine the situation of the third. In employing this principle in locating foreign bodies in the eye, three factors are of importance, namely:

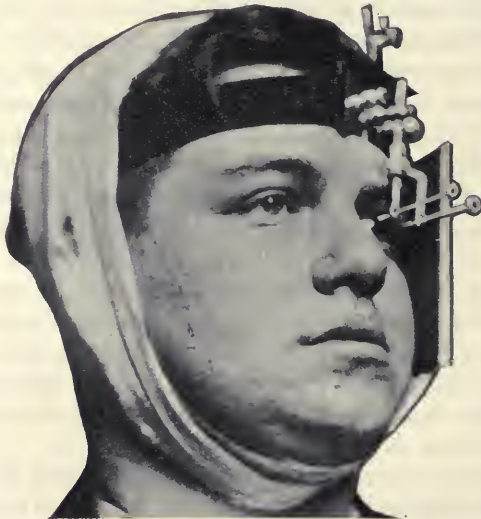
That the two indicating objects shall be at a known distance apart, and shall be parallel to each other and to the plate, and also in a perpendicular line with the plate.

That one object shall point to the centre of the cornea and be at a known distance from the eyeball; and

That the visual axis shall be parallel to the indicators and to the plate.

With the above facts known, it is unnecessary to take a measurement of the angle of the tube with the plate, as this is readily determined from the negative. The two indicators being parallel to each other and to the plate, the distance the shadow of one of the balls is posterior to that of the other is the measure of the distance the source of the x-rays is carried to the front.

FIG. 1.

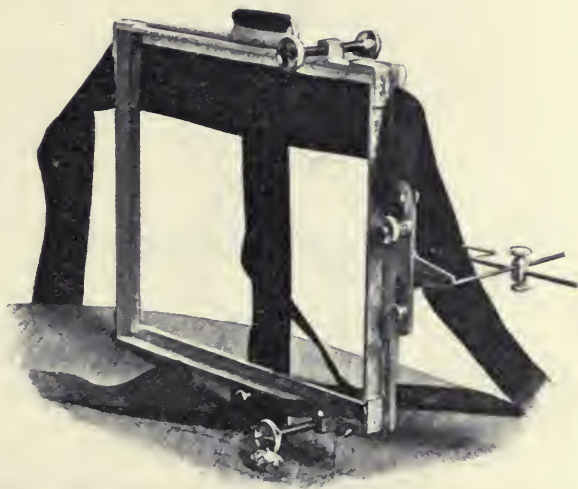


Indicating apparatus supported by head-band and plate held in place by bandage.

The indicators may be supported by a head-band and the plate held in place by an ordinary bandage, although more accurate results are obtained by employing a special form of apparatus, in which the indi-

cators are attached to the plate-holder, and are at all times parallel to each other and to the plate. The indicators are adjustable, so that one may be placed opposite the centre of the cornea while the other is toward the outer canthus.

FIG. 2.



Indicating apparatus and plate-holder combined.

In making the negatives the tube is in front, about thirteen inches from the plate and at an angle of from fifteen to forty degrees with a vertical plane passing through the apex of each cornea. The plate is to the opposite side of the head, and the rays pass through the eyeball and the external orbital wall before reaching the sensitive film. Two exposures are made, one with the tube in a horizontal plane with the two indicators, and the second at any distance below. The angle of the tube below the horizontal is unimportant as long as the two exposures give different relations of the indicators on the negatives.

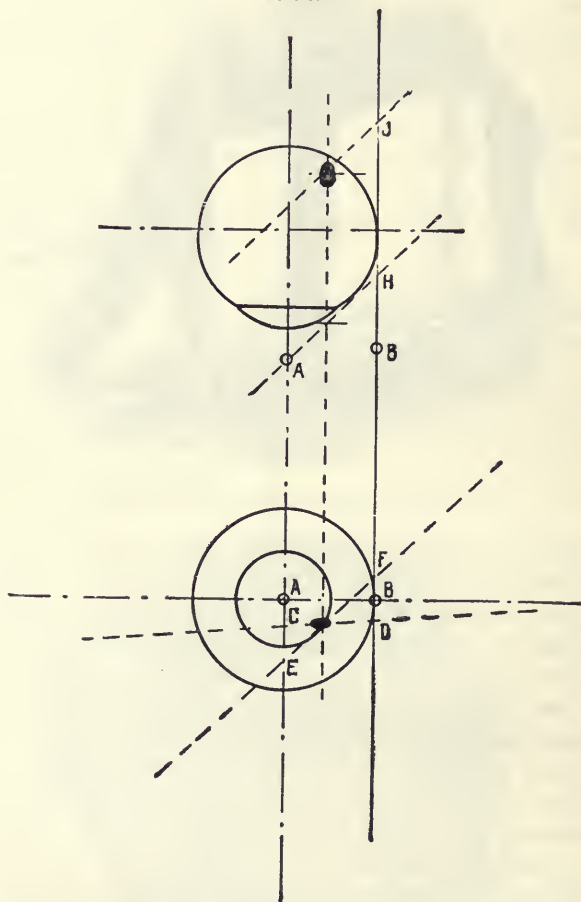
In determining the position of the foreign body in the eye, two circles 24 mm. in diameter (equivalent to the size of the globe) are drawn upon paper. One circle represents a horizontal section of the eyeball, and the other a vertical section. Upon the vertical section a spot is made at the centre of the circle, indicating the position of the central indicator of the apparatus. The distance between the two indicators is measured toward the temporal side, and a spot made to show the position of the external indicator.

On the circle representing a horizontal section of the eyeball a spot is made anterior to the centre of the cornea and at the same distance that the centre indicator was from the eye when the radiograph was made. Another spot to the temporal side, measured by the distance

between the two balls of the apparatus, marks the situation of the external indicator.

By taking the first negative with the tube horizontal to the two indicators, we measure the distance of the foreign body above or below the

FIG. 3.

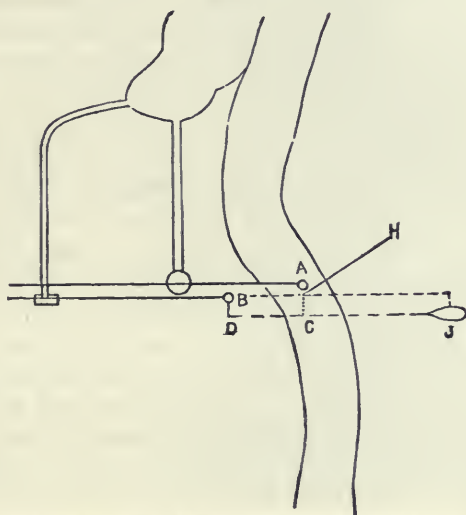


Diagrammatic circles of the eye, upon which measurements from the radiographs are made to show location of foreign body. Upper circle, horizontal section; lower circle, vertical section of eyeball. Patient of Dr. Wm. Thomson.

two balls of the apparatus. These measurements are indicated on the circle representing the vertical section of the eye, and a line is drawn through the points. At some point along this line is situated the foreign body. From the second negative, made with the tube below the plane of the two indicators, the measurement is taken of the distance the shadow of the foreign body is above or below the centre indicator, and

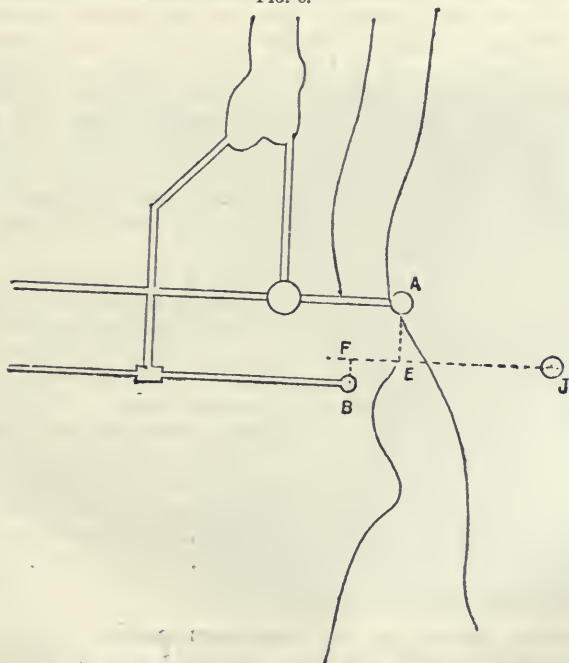
this point is indicated on the first circle. The same measurements are made for the external indicator. Where a line drawn through these

FIG. 4.



Outline drawing of radiograph made with tube nearly horizontal with plane of indicators.

FIG. 5.



Outline drawing of radiograph made with tube below horizontal plane of the two indicators.

two points crosses the line of measurements made from the first plate is the situation of the foreign body as respects its horizontal and vertical position in the eyeball.

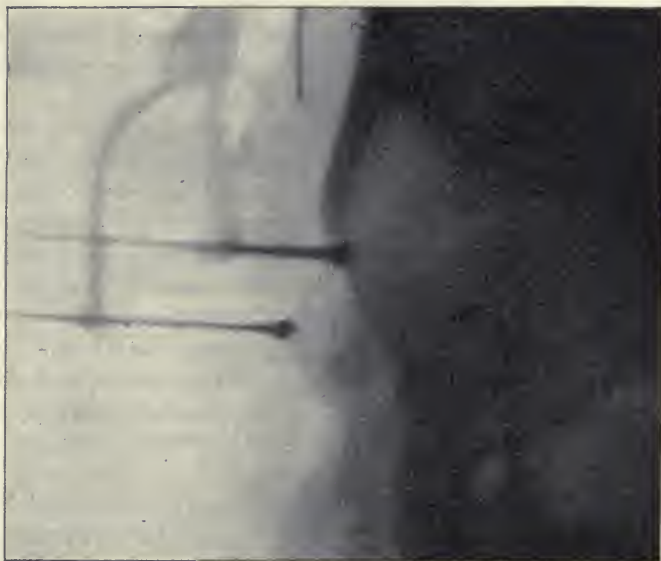
To determine the distance of the foreign body behind the apex of the cornea, one of the negatives is taken and a measurement made of the distance the shadow of the centre ball is posterior to that of the external ball. The distance is entered directly above the external ball on the diagram representing the horizontal section of the eye. From this point a line is drawn through the ball of the centre indicator, which indicates the direction of the rays from the tube when the exposure was made. Taking the plate again, we measure the distance that the shadow of the foreign body is back of that of the external indicator. This distance is marked perpendicularly to the spot representing the ball of the external indicator on the diagram, and a line is drawn parallel to the direction of the rays from the tube. Where this line cuts a line perpendicular to the position of the foreign body shown on the vertical section of the eyeball is the distance the foreign body is behind the anterior portion of the cornea. In cases where the foreign body is in the orbit and outside the eyeball, its location will be indicated by the crossing of the lines beyond the diagrammatic circles.

The first case upon which I employed this method was a young man, twenty years of age, a machinist by occupation. Six months prior to coming to Wills Eye Hospital a piece of steel struck him in the left eye. Dr. William Thomson referred the case to me to determine the presence of a foreign body and its probable location. Examination in April, 1897, showed a scar in the sclera 3 mm. from the corneal margin on the temporal side, starting from the horizontal plane and extending downward almost vertically about 4 mm. The ophthalmoscope failed to reveal the presence of a foreign body, but showed a cone-shaped mass of new tissue extending through the vitreous, with the apex at the disk. The visual field was lost centrally and to the nasal side, but partially preserved downward and outward.

A number of radiographs were made with the Crookes tube in various positions, and in each of the negatives the shadow cast by a foreign body was plainly visible. The two indicators in each exposure were 12 mm. apart, while the ball of the centre indicator was 4 mm. from the apex of the cornea. The external indicator was inadvertently placed 2 mm. nearer the eyeball than the centre indicator. This difference is allowed for on the diagrams. The exposures averaged four minutes each. Employing the method previously described, the measurements from the negatives indicated the position of the centre of the foreign body to be a point 20 mm. from the centre of the cornea, 5 mm. to the temporal side, and 3 mm. below the horizontal plane. The negatives also gave the probable size of the body to be 4 mm. long, 2.5 mm. wide, and 1 mm. thick.

In reporting the case at the Washington meeting of the American Ophthalmological Society, Dr. Thomson stated that, owing to the mass

FIG. 6.



Radiograph made with tube below horizontal plane of indicators. Patient of Dr. Wm. Thomson.

FIG. 7.



Radiograph made with tube nearly horizontal with plane of indicators. Patient of Dr. Wm. Thomson.

of tissue surrounding the body, it was found to be impossible to remove it by the magnet, and that recourse was had to dissection. The body was extracted with some of the cicatricial mass surrounding it from a point in the sclera corresponding to that shown in the diagrams made from the radiographs, with preservation of the eyeball.

The rays were also employed on a patient sent to me by Dr. Jackson, who presented the history of a piece of metal flying into the eye twenty years ago. Examination by Dr. Jackson and by many other gentlemen, at the time the case was shown at a meeting of the Section on Ophthalmology of the College of Physicians, showed a dark mass lying to the temporal side of the disk, about $\frac{1}{2}$ mm. long and $\frac{1}{8}$ mm. in width, in an area of atrophied choroid and pigment deposit rather smaller than the disk.

Notwithstanding that over a dozen negatives were made of the case at different times with Crookes' tubes running under various degrees of vacuum and placed at various positions, no evidence of a foreign body was shown on a single negative.

The failure of the Röntgen rays to show on the photographic plate the presence of a foreign body in the eye when the ophthalmoscopic examination apparently indicated the existence of a body in the eye, led me to make a number of experiments on the cadaver to determine, if possible:

1. How small a metallic body in the eye could be determined by means of the Röntgen rays.
2. To what extent the bones of the orbit interfered with the passage of the rays.
3. The character of the tube and the vacuum at which it should be operated to give the best results.
4. The best point at which to place the tube.

Experiments were made in the pathological laboratory of Jefferson Medical College on a fresh, well-developed male subject. The shrunken eyeballs were removed, and fresh pigs' eyes employed in which pieces of iron had been inserted. In this way the nearest approach to the ordinary conditions met with in the live subject was secured.

In making the experiments on the cadaver exposures were made with two forms of the Queen focus-tube. In one tube the rays from the concave cathode focussed to a small point on the platinum plate, while in the second tube the focus was larger. In one of the pig's eyes a piece of fine wire was passed through the centre of the globe in its antero-posterior diameter. In another pig's eye three pieces of wire, about one and one-half inches long, were inserted in the nasal half of the pig's eyes, entering at the corneoscleral margin and passing through the ball to the retina. The wires were respectively $\frac{9}{10}$, $\frac{1}{2}$, and $\frac{3}{10}$ mm. in diameter. The largest piece was partially cut through at intervals of

1 mm. In a third pig's eye pieces of iron were inserted in the ball, each about 1 mm. long, and varying in thickness from $\frac{3}{16}$ to 1 mm. The bodies were inserted in the eye at the nasal side. A number of exposures were made with each tube, several at an angle of fifteen degrees, with a vertical plane passing through the two eyes, and a number at an angle of about forty degrees in front of this plane.

These experiments seemed to leave no doubt as to the great superiority of the small focus-point tube as compared with that of large focus. The shadow of even the finest wire is distinctly shown on the negatives made with the former, while in those made with the latter the shadow of the wire is blurred and indistinct. This is in harmony with the well-known fact that the distinctness of the shadow of an object some distance from a plane surface depends upon the size of the source of light, and where the point of illumination is large, as compared with the size of the object, the shadow cast may be indistinct or even imperceptible.

The negatives also show to what small degree the bones of the orbit obstruct the rays. The thickest portion of the external orbital wall is where the frontal and malar bones join, forming the external angle of the orbit. In the deeper portion of the orbital wall the bones are relatively thin. Notwithstanding the difference in the thickness of the bones, the shadows cast by the steel wires are perfectly distinct throughout their entire length. In making radiographs of the eye the best results are secured when the tube is run at high vacuum, so that there shall be great penetration of the ball and the muscular and bony structures. In this way the shadow of the denser metallic body is more clearly shown upon the plate.

In the experiment with the small bodies in the eye the superiority of the small-point focus-tube for eye-work was again shown. The exposure made with the large-point focus-tube failed to show any shadows on the plates of the bodies in the eye, while in the negatives made with the small-point focus-tube each of the five foreign bodies can be clearly seen. In dealing with the live subject the possible slight movement of the head during exposure is a factor of importance.

The position of the tube appears to make very little difference in the results. The negatives made with the tube at an angle of fifteen degrees with the vertical plane passing through the apex of each cornea give as clear shadows of the test objects as when the tube is situated further to the front.

In my experiments I have used several makes of Crookes' tubes, although the majority of the exposures were made with the Queen self-regulating tube. In this tube, by an ingenious arrangement of a shunt circuit, the current passes around the tube when the vacuum becomes too high, heating up an auxiliary bulb of potassium hydrate and bringing down the vacuum. The gap in the shunt circuit may be adjusted

to any desired vacuum, and the tube then runs automatically, irrespective of the length of exposure. The time of exposure was varied from two to six minutes, four minutes appearing to give perfectly satisfactory results, although in one instance an exposure of thirty-five seconds gave a negative of excellent detail.

Since the first employment of the above method of determining the precise location of foreign bodies in the eyeball or orbit, numerous opportunities have arisen of verifying the correctness of the findings by subsequent operation. The value of the x-rays in traumatism in the region of the eyeball is shown by the following case, reported by Dr. H. F. Hansell:¹

H. L., while pounding sheet steel on January 22, 1898, was struck in the left eye by a piece of the metal. He noticed an escape of fluid from the eye and immediate blindness without much pain. Examination at that time showed a linear incision 3 mm. in extent to the nasal side of the vertical diameter of the cornea, and the anterior chamber filled about one-fifth of its capacity with blood. Under cold applications the blood in the anterior chamber cleared up, and a small ragged opening could be distinctly made out in the periphery of the iris opposite the corneal cut.

Several radiographs were made, the plates recording the shadows of *two metal bodies*. One was located in the posterior chamber immediately under and to the nasal side of the lower end of the vertical diameter of the lens, and the other just anterior to the external orbital angle and very close to it in the soft tissues of the upper lid. The body in the eyeball was successfully extracted by the magnet at the point indicated by the radiographs, with the preservation of the eyeball.

A unique feature of this case was the discovery by the x-rays of the presence of a second piece of metal in the vicinity of the eyeball. The finding was confirmed by passing the magnet point over the part of the lid indicated by the radiographs to contain the body, the skin being raised fully one-quarter inch, showing conclusively the presence of a metal body in the tissues beneath this spot. The patient could not account for the presence of the metal body so near the eye. It certainly did not enter the lid at the time of the injury that destroyed sight.

In the following case reported by Dr. Louis F. Love,² the foreign body was removed after one unsuccessful attempt from the location indicated by the radiographs:

N. C., while engaged in chipping a rivet-head, was struck in the left eye with a fragment of the metal. The upper lid was cut through, the conjunctivæ œdematous, the sclera and cornea incised, vitreous and iris in the wound, the aqueous turbid, and the ciliary region tender on pressure. The vision equalled faint light perception, and all fundus reflex was lost. A series of radiographs located the body in the upper portion

¹ Section on Ophthalmology, College of Physicians of Philadelphia, March 15, 1898.

² *Ibid.*, April 19, 1898.

of the ball just back of the equator. An attempt was made to extract the body by inserting the tip of the Hirschberg magnet through the enlarged wound of entrance, but was unsuccessful, the battery power employed being insufficient to move the body from the inflammatory exudation that existed. A large amount of bloody serum poured from the globe during the operation, so that the ball almost collapsed. Several days afterward the globe regained its shape, and additional radiographs were taken, which showed that the position of the body was the same as when the first negatives were made. The body was then removed by the magnet through an opening made at the equator just under the indicated location. The patient experienced little pain, and the wound healed readily, leaving the globe in fairly good condition.

The value of early operation in cases of foreign bodies in the eyeball, before inflammatory exudate has formed about the metal, is illustrated in the following case, reported by Dr. G. E. de Schweinitz:¹

A. G., in loosening a piece of work in a lathe by repeated blows of a hammer, was struck in the left eye by a fragment of steel. The metal penetrated near the centre of the cornea, passed through the lens, and rendered the media so opaque that ophthalmoscopic examination was impossible; indeed, the lens in the ten hours that elapsed from the time of injury had become cataractous. A series of radiographs made the day following the injury indicated a piece of metal about 3 mm. long and 1 mm. wide situated 2 mm. below the horizontal plane of the globe, nearly 2 mm. to the nasal side and 23 mm. back of the centre of the cornea. The next day an incision was made through the sclera just below the lower margin of the external rectus, and the broad, flat extension point of a Hirschberg magnet introduced a distance of 15 mm., so as to bring it as nearly as could be calculated over the position of the macula. On withdrawing the magnet point a piece of steel, of triangular shape, of the size indicated, and weighing one-seventh of a grain, was found adhering to it. Three weeks after the operation the eye was still much injected and the tension raised owing to the swelling of the lens. The light-perception, however, is good in all portions of the field, although the condition of the eye indicates later enucleation as probable.

No better example of the value of the Röntgen rays in ophthalmic surgery could be found than is furnished by this case. The media were clouded, and there was no other means of determining whether the metal was imbedded in the opaque lens, was lodged in the vitreous chamber, or had passed completely through the eyeball into the orbit. The radiographs not only indicated the portion of the eyeball in which the body was lodged, but rendered possible a determination of its exact location.

¹ Ibid.

HEMORRHAGIC INTERNAL PACHYMENINGITIS IN CHILDREN.

REPORT OF TWO CASES.

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MOST writers upon nervous diseases who make any mention of the occurrence of chronic internal pachymeningitis in children regard it as a rare occurrence. Sachs,¹ in his recent text-book, does not describe the condition, and I have known the existence of the lesion in children to be questioned by experienced neurologists. On the other hand, Doehle,² of Kiel, found a new membrane attached to the inner surface of the dura in 48 out of 597 autopsies on children under ten years of age—that is, in more than 17 per cent. of his autopsies. Although these figures are surprisingly high, it seems probable that chronic internal pachymeningitis is hardly to be regarded as a rarity in hospitals for children, and that the lesion in its slighter grades may be readily overlooked. Certain it is that the lesion is sufficiently frequent to deserve more attention than it has received. It is with a view to increasing the interest in this condition, which is not without practical importance, that I desire to report the following cases of chronic internal pachymeningitis, each of which was characterized by the occurrence of hemorrhage.

CASE I.—A female child, aged five and one-half months, was admitted to Dr. Kimball's service in the Babies' Hospital on May 15, 1897. The family history was entirely negative. The patient was the first child. It is said that the child was well until one month ago, when it began to vomit, and vomited frequently until a short time previous to admission. The bowels were constipated. Examination showed that the child was fat and well nourished. The head was about normal in size and shape. The fontanelle measured two by two inches, and was not bulging. The sutures were open, and there was a soft spot over one parietal bone. The eyes, ears, nose, and mouth were normal. There were no teeth. Coarse râles were heard throughout the chest. The child vomited on the third and fourth days after admission. On the fifth day she developed tremor in the hands, especially marked in the right hand. The fontanelle was at this time rather tense, and the veins of the scalp distended. From time to time nystagmus was present, lateral and vertical in character. The pupils were small and responded feebly to light at times.

Nine days after admission the child had a general convulsion, which began with twitching in the ocular muscles and extended to the hands and feet. During the seizure the left arm and leg were rigid, while the right arm and leg were the seat of clonic spasm. The mouth deviated to the left. The duration of the seizure was about ten minutes. Cyanosis

¹ Nervous Diseases of Children, 1895.

² Verh. d. X, Internat, Congress, 1890, Bd. v, (Forensic Section),

was a feature of the convulsion. Ten hours after the first convulsion a second occurred, lasting about three minutes and closely resembling the first. After these seizures it was noted that the fontanelle was slightly sunken, and that the head constantly deviated to the right. Previous to these paroxysms the child had been drowsy; it now became semi-comatose for a time, but later was wakeful. The child grew gradually weaker, owing partly to the persistence of a severe colitis, which was the cause of the admission to the hospital, and after a few days died without having developed any new symptoms of neurological interest. The pulse and respiration were featureless and such as one might expect in any young child whose temperature ranged irregularly from 100° to 105°. During the last few days there were present the usual signs of bronchitis.

Autopsy by Dr. Woolstein, thirty-three hours post mortem.

ANATOMICAL DIAGNOSIS. Hemorrhagic pachymeningitis; fibrino-purulent pleurisy; acute broncho-pneumonia; pulmonary emphysema and congestion; fatty liver; nephritis.

Body. Plump, no skin lesions. Thumbs adducted, fingers loosely flexed.

Brain. Adhesions between pia and dura along superior longitudinal fissure, also over entire base and over the island of Reil on both sides. Covering the pia at these points there is a membrane, two to three lines in thickness, containing many spirally coiled bloodvessels, all filled with blood.

Pia apparently not adherent to brain. Ventricles normal in size; they contain about one drachm of fluid, hemorrhagic in color.

Choroid plexuses intensely congested, fluid blood in all the sinuses. Pia over cerebellum, pons, and medulla slightly thickened.

Cervical cord shows same conditions; rest of cord not examined.

Cerebrum. Right occipital region; pia detached from cortex in many places, here and there pia stained brown by pigment from extravasated blood. There is perceptible in this region, though more marked in sections from the island of Reil, a splitting up of the membrane overlying the cortex into two or more layers; the inner layer (pia) shows infiltration with small round cells, the layers external to this contain many new bloodvessels, some of which having ruptured, extravasation of blood into the surrounding tissues has occurred. Beside numerous small bloodvessels, the outer membranous layers consist of small round cells, fibroblasts, and a few very fine connective-tissue fibres. Between the layers lies a fine loose meshwork of small round and spindle cells containing a considerable amount of granular material (degenerated red blood-cells and fibrin).

Island of Reil. Same conditions, but much more marked.

Cerebellum. As above; formation of new bloodvessels very distinctly shown.

Choroid Plexus. Granular degeneration of epithelium and marked congestion.

Spinal Cord. Only slight traces of hemorrhage; membrane covering cord shows fibrous thickening; in places there is a division into two layers.

CASE II.—Female infant, colored, aged twenty-two months, illegitimate, first child; mother healthy. Nursed for seven months. Since nursing was stopped has had repeated attacks of bronchitis. The child never walked or stood alone.

Examination: The head is markedly rhachitic, square, and flat on top. The anterior fontanelle measures three by two inches. The ribs are beaded; there is a marked lateral depression of the chest, and the epiphyses are enlarged.

The child's first stay in the hospital, about two months in duration, was featureless except for the facts that there were gradual slight loss in weight, considerable prostration, and numerous râles over both sides of the chest. During a second stay in the hospital, lasting a month, the child gained weight and showed no signs of bronchitis.

In October, 1897, the patient was admitted for a third time to Dr. Holt's service. It is stated that she was well until three days before admission, when she had four convulsions, followed the next day by five similar seizures. The general condition was very bad. There were signs of general bronchitis. The hands and feet were in the position of persistent flexor contraction characteristic of tetany. The knee-muscles were slightly rigid. The knee-jerks were unobtainable, and the fontanelle was tense and bulging. The child was in the hospital for five days before death occurred. During this time it grew very drowsy, but this was attributed to the administration of bromides. Hot baths had no effect on the carpo-pedal spasm. There was slight but varying rigidity of the muscles of the back of the neck. Ocular symptoms were not observed. During the last days of life the rigidity of the hands grew less, although there was no alteration in the spasm of the feet and legs. The child died comatose. Bloody mucous diarrhoea was present during the last period in the hospital. Fever was present and daily reached 102.5° or 103.5°.

Autopsy by Dr. Woolstein.

ANATOMICAL DIAGNOSIS. Pachymeningitis hæmorrhagica interna; broncho-pneumonia (acute and chronic); croupous and ulcerative colitis.

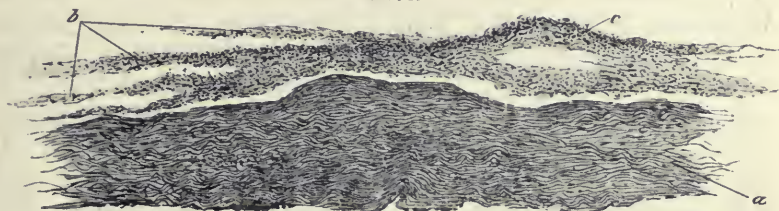
Brain. Weight, 1 pound, 5½ ounces (fontanelle 1½ x 1 inch; bulging). Over right half of convexity, a recent clot, in places one-quarter inch in thickness, covers the entire hemisphere, extending also on its outer surface and over the left occipital lobe. Upon being removed the inner surface of the dura is found lined by a thin, whitish translucent membrane, extending irregularly from the superior longitudinal fissure on either side. Dura thickened and yellow in color. The clot dips between the hemispheres and appears above optic commissure on the base.

Pia congested, and in places moderately œdematous. Ventricles and brain substance apparently normal. All sinuses filled with recent clots. The new membrane is especially distinct in both occipital fossæ.

MICROSCOPIC EXAMINATION. *Cerebrum* (right third frontal convolution and right temporo-sphenoidal lobe). There is some thickening of the pia, due partly to œdema, partly to infiltration with small round cells. The vessels of the pia are congested. Overlying the pia and connected with it by a fine web of branching cells and fibres is a membrane which in places shows distinctly a division into two or three layers. This membrane consists of round and spindle-shaped cells, with here and there a few very fine fibres; numerous small bloodvessels are seen, and hemorrhages have occurred into the meshes of the membrane, and caught within these meshes are red blood-cells, granular fibrin, and brown pigment. In places there are aggregations of small round cells, whose nuclei, staining very deeply with hæmatoxylin, are undergoing

fragmentation (pus); these cells are found chiefly in the superficial layers of the membrane. At points where there has been considerable extravasation of blood the large branching connective-tissue cells are seen to be loaded with brown pigment.

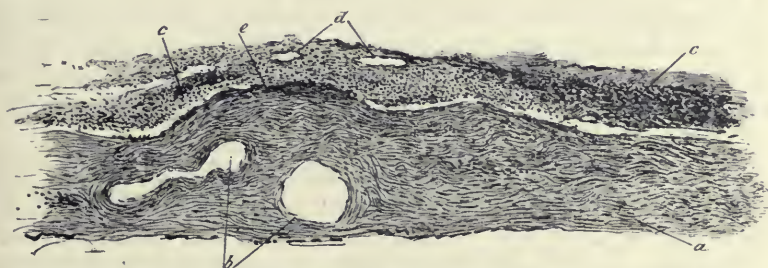
FIG. 1.



a. Dura. b. Layers of membrane. c. Purulent infiltration. Section through dura and new membrane in Case II.

Dura (near superior longitudinal sinus). The fibres are separated from each other by serous infiltration. The dura is covered by a membrane which in some places is thick, in others shows a subdivision into several layers. The membrane resembles that above described. Penetrating between the fibre bundles of the dura are seen fine strands of young connective tissue. Sections of dura taken from other regions show very extensive hemorrhages and brown pigmentation.

FIG. 2.



a. Dura. b. Bloodvessels. c. Hemorrhage into meshes of membrane. d. New vessels. e. Pigment. Section through dura and new membrane in Case II.

These cases illustrate some points in the etiology, clinical history, and pathology of chronic internal pachymeningitis which seem worthy of consideration.

The age of the first patient, five and one-half months, corresponds very nearly to the period of life at which this lesion is most frequent, for of 57 cases in which the age is given, 43 occurred under one year, and of these 34 were not more than six months of age. In a case reported by Northrup,¹ the patient was four years and seven months old, and in one mentioned by Doehle six years, and in another three

¹ Transactions of the New York Pathological Society.

and one-half years. These are the oldest children of whom I have found records. The condition is thus one relating to early infancy.

The majority of infants in whom the lesion is found are badly nourished or cachectic. Rickets was present in at least 13 of 57 cases, and chronic intestinal catarrh in at least 20 of these cases. In eight of Doehle's cases indications of syphilis were present. In the remainder of the 57 cases there is no record of syphilitic lesions or of syphilitic heredity, but in many of these such heredity cannot be excluded. In a few cases the children have been well nourished and apparently normal a short time before the indications of hemorrhage have appeared. As regards the pathological nature of the lesion we are as much in the dark as in the case of the similar lesion with which we meet in adults. The new membrane must be regarded as originating from the proliferation of dural endothelial cells, or, more probably, from the subendothelial connective-tissue cells, the new and cellular connective tissue being exceedingly prone to the development of new bloodvessels with thin walls. Even in cases which we may suppose to originate from hemorrhage we have to recognize an intimate connection between the organization of the clot and the proliferation of dural connective-tissue cells. In some cases there seems to be little inclination to hemorrhage, in others there are numerous punctate hemorrhages from the delicate vascular membrane which constitutes the inner layer of the laminated structure, and occasionally there is an extensive clot which lies in the subdural space, as in the second case reported. In the first case reported the membrane was extremely vascular, and small hemorrhages occurred into the membrane itself; in the second case the vascularity of the membrane was relatively slight.

The membrane varies much in thickness. In many cases it is so thin and delicate that it is readily overlooked unless the occurrence of the lesion be kept in mind. Sometimes it reaches a thickness of two or three lines. In both the cases reported here the membrane was extensive. In both cases it extended from the calvarium to the basal fossæ, and in one it was especially distinct in the occipital fossæ. Doehle noted that the membrane was especially apt to occur in the basal fossæ. He is strongly inclined to look upon the formation of the membrane as secondary to a meningeal hemorrhage at the time of birth, but the evidence for this view cannot be said to be conclusive. The belief that the lesions of internal pachymeningitis may be the consequence of subdural hemorrhage has recently received some support from Wigglesworth,¹ who pointed out the likelihood of hemorrhage arising from degenerated arachnoid veins in early life. It is stated that the experimental introduction of blood into the subdural space has been followed

¹ Brain, 1892.

by the lesions of pachymeningitis. Although we are in no position to deny that extravasated blood may sometimes occasion the formation of the dural membrane, we cannot reasonably look on this as the explanation of the majority of the cases observed in infancy, in which there have apparently been no clinical signs of meningeal hemorrhage. In our first case, for example, the child was apparently normal until a short time before cerebral symptoms appeared, and the supposition of the existence of a meningeal hemorrhage at birth is hardly tenable. In Case II. considerable pigment was found near the line of attachment of the membrane to the dura, some free, some in the bodies of branching connective-tissue cells. It is not possible to interpret the relation of this pigment to the large hemorrhage, but there is no good reason for thinking that the locality of this pigment, which appears recent, indicates that the membrane originated from a layer of blood on the inner surface of the dura. The old experiments of Kremiansky,¹ who succeeded in producing some of the lesions of convexity internal pachymeningitis in dogs, by means of chronic alcoholic intoxication, indicates that an intoxication may give rise to the formation of a highly vascular membrane consisting of young connective-tissue cells and vessels. In many of the cases recorded in literature there is reason to suspect that pathological blood states may have existed, and that intoxications may have played a rôle in the development of the intradural lesion. But it is so common to find severe intoxications without such lesions that this does not seem a wholly satisfactory explanation. The intoxication theory also fails to explain the occurrence of the membrane in apparently healthy children. It may be that future pathological and clinical observations, together with experimental studies looking especially to the nature of the irritants which are competent to incite the dural connective tissue to proliferation, will show that the lesions with which we meet may be sometimes of inflammatory, sometimes of hemorrhagic origin, or, to be more accurate, will show that hemorrhage is one of the causes of the inflammatory lesion which we call chronic internal pachymeningitis.

In sections from Case II., in which the membrane is less richly cellular and vascular than in Case I., the inner or free edge of the membrane is infiltrated with small spheroidal cells, whose cell-bodies are indistinct and whose nuclei are multiple and usually rounded and very distinct. The cells are probably leucocytes in which nuclear fragmentation has occurred. We are almost justified in speaking of the inner layers of the membrane as being the seat of a purulent inflammation, although the surface of the membrane was not covered with pus. I have met with no description of similar appearances in pachymeningitis, and the coincidence of such an exudative inflammation with the usual lesions of

¹ Virchow's Archiv, Bd. 68.

hemorrhagic pachymeningitis is certainly of much pathological interest. Doehle expresses the belief that the condition of marasmus seen in many of his cases may have been due to a trophic disturbance of the cortex cells dependent on damage by the pachymeningitis. In view of the frequency of intestinal catarrh in these patients Doehle's explanation seems superfluous; but it would, nevertheless, be interesting to look carefully for indications of structural change in the cortex which might be attributable to the influence of the dural lesion.

The presence even of an extensive and moderately thick membrane seems not to entail symptoms. If it does we have yet to learn what they are. It is probably impossible to recognize the condition until hemorrhage occurs, and even then the diagnosis is rarely to be made with confidence. The reported cases are not sufficiently numerous to enable us to study statistically the symptoms that accompany hemorrhage, but an idea may be formed of the character of the usual clinical phenomena. Where small hemorrhages from the newly formed vessels occur into the membrane itself there are probably no obtrusive cerebral symptoms. In a number of such cases the occurrence of a cerebral lesion has not been suspected during life. It is quite likely that slight cerebral symptoms in such cases are masked by the habitual apathy of these very young and usually marantic children. Where a hemorrhage of considerable size occurs, either into the new membrane or chiefly into the subdural space, the symptoms of irritation or compression of the cerebral cortex appear to be seldom absent. The hemorrhage is probably more often one-sided than bilateral, and the symptoms are generally correspondingly unilateral. The most frequent symptoms, where the hemorrhage is large, are rigidity, convulsions, and coma. If the hemorrhage occurs slowly convulsions may be absent, and rigidity with deepening coma constitute the only symptoms. When convulsions occur they may be repeated in groups a few days apart, sometimes owing to the occurrence of repeated hemorrhages of moderate size. Paralysis was noted in only a small portion of the hemorrhagic cases. Contracted pupils were observed in three out of nine cases. Tremor in the side opposite the lesion was seen in the first case. The symptoms of tetany were observed in the second case, and certainly constitute a feature of considerable interest. It is true that the phenomena of Trousseau and of Chvostek were not sought for, but the carpo-pedal spasm was so persistent that so careful an observer as Dr. Holt looked upon the condition as tetany. Carpo-pedal spasm or tetany is not rare without hemorrhagic pachymeningitis, and it does not seem certain that the spasm is in this instance to be referred to the lesion.

The fontanelle is usually bulging at the time of the onset of cerebral symptoms. The temperature is moderately elevated, the pyrexia being probably less than in the case of meningitis. Febrile complications,

however, are so common that the temperature, pulse, and respiration of uncomplicated cases can rarely be studied. In fatal cases the duration of the cerebral symptoms is from a day to a week.

It is evident from the foregoing description of the symptoms of hemorrhagic internal pachymeningitis, that we can hardly hope to make the diagnosis with any degree of certainty. An extensive pial hemorrhage occurring in the course of an acute infectious disease, such as pneumonia, may apparently cause closely similar phenomena. I do not feel certain that there is any symptom or combination of symptoms which we meet in hemorrhagic internal pachymeningitis which we may not occasionally encounter in the course of a severe acute infection without the presence of any cerebral lesion whatever. At the same time hemorrhagic pachymeningitis is a lesion which we should think of as a possibility whenever we meet with unilateral rigidity and convulsions, with deepening stupor, in a cachectic or rachitic child under one year of age. In the absence of the signs of pneumonia and tuberculosis, I think this diagnosis gains distinctly in probability, as we may then exclude with some confidence an important cause of infantile meningeal hemorrhage and also tubercular intracranial lesions.

Holt¹ has called attention to hemorrhagic pachymeningitis as a cause of the chronic cerebral palsies of children. I do not think it has yet been proven that this is one of the ways in which these palsies arise; but if it be true that children occasionally survive a hemorrhage from pachymeningitis sufficiently long to produce a chronic palsy, the anatomical evidence of this will surely be forthcoming.

One other aspect of internal pachymeningitis in children deserves mention. It is probable that relatively slight traumatism to the head may occasion the rupture of vessels in a highly vascular membrane. This fact gives these cases a certain medico-legal importance. Doehle reports the case of a careless mother who allowed her apparently healthy infant to fall out of bed. The child was found comatose and died. The autopsy showed that the child had a hemorrhage from a subdural membrane. The question of the influence of trauma may thus arise.

Although it cannot be contended that hemorrhagic pachymeningitis in children is a frequent condition, even in hospitals for children, there are no doubt more examples of it than is generally supposed, and it is likely that its precursor, chronic internal pachymeningitis, is by no means rare. My object has been accomplished if I have succeeded in emphasizing the fact that this condition is worthy of study and not without practical interest.

¹ Diseases of Infancy, 1897.

REVIEWS.

MAMMALIAN ANATOMY. A Preparation for Human and Comparative Anatomy. By HORACE JAYNE, M.D., Ph.D., Director of the Wistar Institute of Anatomy and Biology, Professor of Zoology in the University of Pennsylvania. Part I. The Skeleton of the Cat: Its Muscular Attachments, Growth, and Variations Compared with the Skeleton of Man. With over 500 original illustrations and many tables. Pp. 816. Philadelphia: J. B. Lippincott Co., 1898.

PROF. JAYNE offers in this book, just issued from the J. B. Lippincott Co.'s press in Philadelphia, one of the most important contributions of recent years to systematic morphology. The volume deserves careful consideration from two points of view. In the first place, attentive perusal of the more important portions of the book will convince that Prof. Jayne has produced the most complete and thorough systematic description of the cat's skeleton extant. As a monograph of the osteology of the domestic cat his work will be valuable to comparative anatomists, offering as it does a sound basis for more extended serial study of the osteology of the *felidæ* and of carnivora in general. The details of descriptive anatomy are thoroughly and carefully considered in the text, and the work is profusely illustrated by a series of very handsome and accurate original illustrations of the bones of the cat. Special mention may well be made of the chapters dealing with the skull, face, carpus, and tarsus. The account of the teeth is a model of concise and correct odontological description, the pages on the variations and abnormalities of the teeth being especially valuable. In fact, throughout the entire work the care with which the author has considered the subject of variation will make the book most useful to comparative anatomists. It is a matter of some regret, however, that more stress has not been laid upon the phylogenetic value of the variations described. For instance, the total numerical and group variations of the vertebral column are dealt with in detail, but the student is offered no general data indicating the value of such observations from the stand-point of general morphology. This is especially to be regretted, as Prof. Jayne's book is designed to form an introduction to general comparative and human anatomy.

This brings us face to face with the second aspect in which the book will have to be considered. Prof. Jayne, in his preface, very properly points out the practical difficulty and loss of time encountered by teachers of anatomy, "owing to the fact that none of the existing textbooks sufficiently cover the ground or emphasize the close relationship between the anatomy of the inferior animals and the anatomy of man." The preparation of the volume was undertaken for the purpose of supplying this need. Prof. Jayne's statement gives voice to a feeling which has of late years gained more and more ground among teachers of anat-

omy the world over. The fact, long ignored, or only sparingly and almost reluctantly accepted, is becoming recognized, that sound instruction in the anatomy of the human body cannot be attained without utilizing to the fullest extent the aids which comparative anatomy and embryology so abundantly offer. This conviction has led in Germany to the publication, just undertaken, of the extensive work on human anatomy, now being issued under the editorship of Prof. Bardeleben, and we welcome Prof. Jayne's work as evidence that similar convictions are gaining ground among scientific anatomists on this side of the Atlantic. However valuable the present volume may, and unquestionably will, prove to the systematic comparative anatomist, as a complete osteological monograph of the cat, this second and broader purpose of its publication will determine its future standing among the productions of similar intent which will undoubtedly follow. In one way the limitations which Prof. Jayne has set himself in his work make it impossible to judge it by the standards which will have to be adopted in the future. Comparative anatomy and embryology, if they are to be of true service in the preparation for or in the actual pursuit of the study of human anatomy, must of necessity deal with broad divisions of the subject. Knowledge of direct use in the interpretation of the human structure must be drawn from the study of a number of individual forms, each furnishing morphological facts and data capable of being used separately or in serial combination in elucidating the peculiarities of man's structure and his phylogenetic position in the mammalian series.

Hence a monograph dealing exhaustively with the anatomy of a single mammalian species, while it gains in completeness and accuracy *as a monograph*, loses correspondingly in plasticity, and becomes less of a commentary on and an aid to the study of the structural conditions found in higher forms.

The value of Prof. Jayne's work will have to be judged with these natural limitations which the scope of the volume carries with it.

Turning to details, the arrangement of the subject matter of the book calls for consideration.

The introductory chapter (p. 48) offers an excellent account, well adapted to beginners, of the general plan of the vertebrate body and of the skeleton in particular. The parts dealing with the question of anatomical nomenclature are especially lucid and concise, and well selected as regards range and subject matter. It would have been preferable if the author had not refrained from giving a precise definition to the terms "external" and "internal" as applied to the body-cavities and walls. This could have readily been done in connection with the admirable terminological diagram of a transection of the body (Fig. 12).

The pages dealing with the development and structure of the joints are excellent. The description might, however, with advantage have been amplified by considering the character and derivation of intra-articular disks and ligaments in connection with joint-formation, especially with a view toward adapting the book to the needs of preliminary students of anthropotomy. The same might be said in regard to the simpler principles of diarthrodial mechanics. It is to be remembered, however, that the plan of the entire work is a strictly systematic one, and that in all probability one of the succeeding volumes dealing with arthrology will take up all such details.

Figure 8 is to be deplored as indicating a covering of opposed diar-

throdial articular cartilages by a synovial membrane, thus perpetuating the "closed sac" theory.

In the body of the book the detailed systematic osteological descriptions are uniformly clear and to the point. If a fault is to be found it lies in the fact that general morphological considerations have been to a large extent subordinated to descriptive details. For instance, it would have been preferable, in our opinion, to bring out (p. 116) distinctly the value of the costal elements and transverse processes in the general consideration of the vertebral column, rather than base the comparison of the cervical group with the remaining vertebral segments upon the behavior of "dorsal" and "ventral" "elements." While to the trained anatomist the author's meaning is at once apparent and the correct grouping of the vertebral segments easily obtained from the text, yet, as the book is primarily intended for beginners, it would lose nothing if the cardinal morphological facts were grouped together in a more forcible and definite manner.

The same criticism might, for example, be made in reference to the treatment of the morphological significance of the dorsal and ventral sacral foramina. We regret that the excellent schematic transection of the sacrum (Fig. 71, p. 100) has not been made the base for a more complete and clear definition of the relation between the sacral and the intervertebral foramina.

In the cardinal matter of the comparison between the bones of the cat and the corresponding parts of the human skeleton, we confess to a distinct sense of disappointment.

In the first place, the illustrations of human osteology used in the book are far inferior to the original drawings of the cat's bones. They are apparently largely reproduced from Leidy's work on human anatomy, but they are not up to modern standards of illustration, and fail to answer the purpose for which they are intended in this book. Much would have been gained by the direct juxtaposition of the human bones and the bones of the cat, drawn in the same position and from the same point of view, and correspondingly labelled. It would have been of distinct advantage, for instance, if the excellent plan of indicating the position of the principal bones of the cat's skull in heavily shaded outline had been extended to the human skull. As it is, the student who utilizes his knowledge of the cat's skeleton will experience, in beginning his study of human osteology, difficulty in correctly placing and interpreting corresponding parts.

In the same sense a closer union of the portions of the descriptive text dealing with the bones of the two forms would seem to us desirable. The value of comparative anatomy to the student of anthropotomy lies in this very close and immediate application of his knowledge of the structure of lower forms to the structure of man. The medical student especially requires that the aid which comparative anatomy can afford him in his studies should be immediately and directly available.

It is, of course, impossible that in a work of this size and character opinions should not differ as to the value of some of the methods of treating the subject. We desire, however, to reiterate our conviction that scientific morphologists will heartily welcome Prof. Jayne's book as a timely departure from old-established lines, and we extend our congratulations to him on the general excellence of the first volume of his series.

G. S. H.

TRAITÉ DE MÉDECINE ET DE THÉRAPEUTIQUE. Publié sous la direction de MM. P. BROUARDEL et A. GILBERT. Tome quatrième. Maladies du Tube digestif, Maladies der Péritoine. Paris: J. B. Baillière et fils, 1897.

TREATISE ON MEDICINE AND THERAPEUTICS. Edited by BROUARDEL and GILBERT.

THIS volume (for review of Volume I. see *THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES*, August, 1897, p. 207) well sustains the high standard of the system, although, on account of the nature of the subjects considered in it, there is not so much originality of method. It contains articles on the "Diseases of the Mouth and Pharynx," by J. Teissier and G. Roque; "Diseases of the Oesophagus and Intestines," by L. Galliard; "Diseases of the Stomach," by G. Hayem and G. Lion; "Intestinal Worms," by A. Laboulbène; "Dyspepsia and Diarrhœa of Infants," by V. Hutinel and Thiercelin, and "Diseases of the Peritoneum," by E. Dupré.

In the arrangement of the various sections novelty is not attempted; and apparent inequalities of space, some of which are mentioned below, have no doubt been designed. Some idea of the methods pursued may be gathered from the following extracts from the chapter on Bucco-pharyngeal Diphtheria. The monobacillary toxic and the polymicrobial infectious forms are separated with great distinctness, the diagnosis, of course, to be made on bacteriological grounds. The serum treatment is to be used as soon as a clinical diagnosis is made, without awaiting the result of cultures. The dosage of serum is stated in cubic centimetres (20 to 40) instead of the only scientific dosage by antitoxic units. The larger doses are used in the polymicrobial cases, on account of the increased virulence of the specific germs. In common with many Continental authorities, the authors advise against the local use of carbolic and bichloride solutions, though admitting milder antiseptics. The immunizing use of antitoxin is also advised.

The section on Diseases of the Stomach, covering 335 pages, is, on the whole, the best in the book, forming really a monograph representing the most recent views of Prof. Hayem, and especially valuable for that reason. The methods of examination are described with great fulness in the beginning, including the use of the gastrodiaPHONE and the gastroscope (that of Mikulicz only is mentioned). Thirty-four pages are given to chemical methods and their indications, with a brief historical note, giving essentially a résumé of the methods of Hayem and Winter. This is followed by chapters on Symptoms, such as dilatation, vomiting, hemorrhage, etc., and on the remote effects of gastric disease, both general and as affecting organs. Under special pathology, gastritis occupies an important place, having no less than eighty-eight pages. The interesting historical development of the subject, especially in France, is well described; the various anatomical varieties and their clinical characteristics are fully explained; the relations to other, especially nervous, diseases, are made clear. Finally, the anatomical and chemical diagnosis is elucidated; for the authors, unlike some of their followers, do not think that gastric pathology can be represented by simple algebraic formulæ. "Embarras Gastrique," rarely mentioned in English literature nowadays, is described as a syndrome dependent on many affections, general and local, and its relations to gastritis, acute indigestion, and typhoid fever are considered.

Passing to diseases of the intestines we find the general plane of excellence preserved, although many of the chapters, especially those on Enteritis of various kinds, are disproportionately short. Appendicitis is well described within rather narrow limits. The author is not altogether ignorant of work done outside of France. But where did he find "les Américains" who recommend exploratory puncture? The chapter on Parasites is also well done. The authors repeat the groundless statement that Chabert, Duncan, and Lyell "have seen" ankylostoma in the United States. Least satisfactory of all is the short chapter on Intestinal Diseases of Infants. The authors seem to have a very uncertain grasp of the peculiar features expected in such a chapter. That on Peritoneal Disease, on the other hand, is admirable, though too short.

On the whole the book is a good example of works of its kind. Physicians who depend on the English language for information will miss nothing essential if the work is never translated; but those who like to note the differences of view in different countries, and to see how various ways may in practice lead to the same end, will find this a convenient, well arranged, and not too verbose guide to French practice at the present time.

G. D.

A TEXT-BOOK OF THE DISEASES OF WOMEN. By HENRY J. GARRIGUES, A.M., M.D., Professor of Gynecology and Obstetrics in the New York School of Clinical Medicine, etc. Containing 335 engravings and colored plates. Second edition, thoroughly revised; pp. 728. Philadelphia: W. B. Saunders, 1897.

THIS book, written alike for undergraduates and graduates, aims to give American modes of treatment and ideas. It reflects the large experience of the author, both as a clinician and a teacher, and comprehends much not ordinarily found in text-books on gynecology. We think too much space has been given to the consideration of anatomy for a work of this kind. While the illustrations are excellent and the text clear and concise, we feel that this chapter is of little practical use, as a thorough knowledge of the subject can only be obtained in the dissecting-room with the aid of a good work on anatomy.

The book has already taken its place among the best works of its kind, and we are glad to welcome it in this its second edition. The work of revision has been carefully performed. As the author states in his preface, patterns of old-fashioned instruments have been replaced by new ones; some of the original illustrations have been improved or redrawn and many new illustrations have been added. Aseptic surgery has been more carefully considered. The Surgical Treatment of Uterine Fibroid and Cancer has been rewritten and much simplified. Vaginal Section has been given that attention which its growing popularity demands.

The book is one of the most complete treatises on gynecology which we have, dealing broadly with all phases of the subject. For this reason we feel that it will be of more value to the specialist than to the undergraduate or general practitioner.

Parts I. and II. of the first section, which are devoted to the devel-

opment of the female genitals and to the anatomy, are elaborate in completeness and are well illustrated. We are tired, however, of seeing such elaborate illustrations of the Hottentot apron as are now appearing in almost every work on gynecology. Here it is honored by a full-page colored plate, and a very poor one at that. Too much praise cannot be given to the chapters on Diseases of the Fallopian Tubes and the Ovaries. They have been brought thoroughly up to date and are written in such a scholarly and masterful manner that the study of them becomes a treat. We congratulate the author upon the success of his first edition, and predict for the present one an equally gratifying reception.

J. S.

THE DISEASES OF WOMEN: A HANDBOOK FOR STUDENTS AND PRACTITIONERS. By J. BLAND SUTTON, F.R.C.S., England, and ARTHUR E. GILES, M.D., B.Sc. London, F.R.C.S., Edinburgh. Philadelphia: W. B. Saunders.

THIS small volume of 422 pages is, as its title implies, intended for students, and, as it doubtless expresses the views of its well-known authors, we predict for it a favorable reception in Great Britain. The teaching which it advocates, however, is so different in many respects from that which is received in this country that it can never become a popular book on this side of the water.

Very little space is devoted to the consideration of plastic gynecology, and the operation advocated for the repair of the perineum is one which has been long abandoned. The authors advocate Tait's operation and make no mention of Emmet's method, which has become so popular here.

The general consideration of abdominal operations and technique, and the chapters devoted to the diseases of the ovaries, tubes, and uterus, can be highly commended for clearness of style and for conservatism of teaching.

Many of the illustrations are excellent, and the general impression given by the book is pleasing.

J. S.

ST. BARTHOLOMEW'S HOSPITAL REPORTS. Vol. xxxii., 1896. London: Smith, Elder & Co., 1897.

THIS volume contains one paper which, although not treating of any one distinct medical or surgical affection, is of especial interest; it is entitled "Clinical Aphorisms from Dr. Gee's Wards." They are classified under special headings—*e. g.*, Phthisis, Pneumonia, Heart Disease, Nephritis, etc.—and form a collection well worth careful study and thought. We find expressed in them many views differing from those common in this country, and they set forth certain English ideas of medicine more clearly, perhaps, than it is easy to obtain so succinctly in any other form. We wonder how many American physicians would

agree with this aphorism (No. 65): "The heart-murmur called after Austin Flint, if it really occurs at all, is very rare. Only three or four well-marked cases have been recorded." As the murmur is due to a condition which cannot well be demonstrated post mortem, there may be differences of opinion as to the causation of the murmur, but we believe that it is not so infrequent as Dr. Gee teaches. How many of us, again, remember or believe that, "having excluded calculus, hæmaturia in people who are past middle life is most commonly due to granular kidneys"? (Aphorism No. 95.) In speaking of influenza, Dr. Gee remarks, "there is nothing in the symptoms or signs of influenza which enables you to say 'that is influenza.' It is often best, if the patient has had a previous attack, to consult his own feelings in the matter;" this seems to us a very apt saying, when we think of the extensive semeiology of this disease. How can we account for the fact that "the enormous quantities of food which diabetics sometimes consume, to satisfy excessive appetite which occasionally occurs as a symptom of the disease, never seem to cause dyspepsia? The food is easily digested; indeed, there seems to be quite an exceptional development of the digestive function in these cases." (Aphorism No. 224.) We might quote many more, but these are sufficient to characterize their importance. Dr. West reports a curious case of "Profuse Uncontrollable Diarrhœa in a Man Recently Returned from the Tropics," where no cause for this condition could be discovered; the "diarrhœas," speaking generally, are certainly one of our stumbling blocks, both as regards etiology and treatment, but it is to be hoped that in the future either by antitoxins or antiseptics we may be able to accomplish more than we do now in saving cases.

In relation to the valuable paper by Dr. Herringham "On the Occurrence of Rigor and Collapse in Typhoid Fever," there is also reported in this volume a case by Dr. Church where rigors were a most marked symptom all through the attack; the temperature-chart is given, which is not at all typical of typhoid, though we do not mean to imply for a moment that we question the diagnosis, but merely wish to draw attention to this anomalous case. There is a very careful study by Drs. Holmes and Kanthack, "On the Relationship of Cardiac Hypertrophy and Œdema to Chronic Renal Disease," worked out from the post-mortem records; the results do not disclose anything new, but the importance of the paper rests on the analysis of a large number of cases; they conclude that "this points directly to our belief that renal œdema is more commonly met with in the earlier forms of parenchymatous or tubal nephritis, and that as the lesion becomes chronic and more interstitial tissue develops, the œdema disappears, while at the same time also the albuminuria and oligæmia gradually lessen until they almost or completely vanish." The majority of the papers in this volume deal with medical subjects, and there are only two or three on surgical topics or cases. There is no article that we should wish to see omitted, which is the highest praise we can bestow on these reports, for whether it be a case reported or a longer study of some morbid condition, each paper is valuable in itself either from its subject or manner of presentation.

It is needless to speak of the elegance with which the report is printed, both as regards type and paper, except to stimulate American publishers to greater nicety in printing reports from institutions in this country.

R. N.

TEXT-BOOK OF PHYSIOLOGY. Edited by E. A. SCHÄFER, LL.D., F.R.S., Jodrell Professor of Physiology, University College, London. Vol. I. Pp. 1036, with 3 plates and 92 figures in the text. Edinburgh and London: Young J. Pentland; New York: The MacMillan Company, 1898.

It is about twenty years since the celebrated *Handbuch der Physiologie*, in six volumes, edited by Prof. L. Hermann, was published in Germany. The articles comprised in that work were written by physiologists who were representative investigators and authorities in their special line of study, and in consequence these volumes became veritable storehouses of information, to which many teachers and investigators have turned ever since. But a space of twenty years could not elapse without bringing to light many new facts and many new interpretations of old facts. In addition, the size of the *Handbuch* and the fact that it was written in the German language have certainly limited the number of those teachers and investigators who directly consulted its authoritative statements. To remedy these defects for the English-speaking physiologists, or, in other words, to produce an English book which, being fully abreast of modern physiology, would give full, precise, and authoritative information, together with references to the original authorities, has been the object of the editor and his collaborators of this work, the first volume of which lies before us. It is a book, therefore, written for the advanced student of physiology, for investigators and for teachers.

As an enormous amount of literary labor is required for the production of such a work, the different subjects which collectively constitute the modern science of physiology are treated by different authors, all of whom are leading physiologists in Great Britain and well known for their original investigations and general knowledge of physiological science. The present volume deals with the following subjects: "The Chemical Constituents of the Body and Food," by W. D. Halliburton; "The Blood," by E. A. Schäfer; "Hæmoglobin," by A. Gamgee; "A General Account of the Processes of Diffusion, Osmosis, and Filtration," by E. W. Reid; "The Production and Absorption of Lymph," by E. H. Starling; "Chemistry of the Digestive Processes," by B. Moore; "The Salivary Glands," by J. N. Langley; "Mechanism of Secretion of Salivary, Gastric, Pancreatic, and Intestinal Juices," by J. S. Edkins; "Mechanism of Bile Secretion," by D. N. Paton; "The Chemistry of the Urine," by F. G. Hopkins; "The Mechanism of the Secretion of Urine," by E. A. Starling; "The Mechanism of the Secretion of Milk," by E. A. Schäfer; "Secretion and Absorption by the Skin," by E. W. Reid; "Chemistry of Respiration," by M. S. Pembrey; "Animal Heat," by M. S. Pembrey; "Metabolism," by E. A. Schäfer; "Internal Secretions," by E. A. Schäfer.

It is evident that in the treatment by different authors of subjects so closely related as some of the above, it is almost impossible to prevent overlapping, and hence in some places repetitions are to be found. But as the subjects are always looked at from different points of view, these repetitions do not disturb the unity of the work. The impression of unity, moreover, is especially maintained by the harmony of views expressed by the different writers, and likewise by their manner of treatment and the proportion observed in each section. It must be observed, however, that the article on "Hæmoglobin" seems almost too elaborate

and detailed for a text-book of two volumes. Of course, all the new methods and instruments of precision are mentioned. We see a description of Oliver's apparatus for estimating the number of red blood-corpuscles, and of his hæmoglobinometer, both of which will be found extremely convenient and useful for clinical purposes. We find a fine description of the theory and method of spectrophotometry, and of the Band of Soret or band γ of hæmoglobin in the extreme violet part of the spectrum. The illustrations are good and have not been employed too profusely; indeed, at some places a few more might have been used with advantage.

Throughout the work we see evidence of a critical and scientific mind which, for example, regards it "at least probable that a process considered to-day as a 'vital action' may in the future become capable of a simpler explanation," p. 283; which regards the reasoning for the existence of trophic nerves, p. 529, and for separate heat centres, p. 865, in the brain as far from being conclusive.

Two indices of about seventy-five pages greatly enhance the value of this volume.

A. P. B.

THE YEAR-BOOK OF TREATMENT FOR 1898: A CRITICAL REVIEW FOR PRACTITIONERS OF MEDICINE AND SURGERY. Pp. 484. Philadelphia and New York: Lea Brothers & Co., 1898.

THIS welcome digest comes to us, the product of the same corps of contributors with the substitution of Dr. G. A. Gibson (Diseases of the Heart and Circulation), and Dr. Herbert P. Hawkins (Diseases of the Stomach, Intestines, and Liver). These departments are certainly presented with the same high standard of intelligent criticism as their predecessors. While much in this volume is familiar to those who read attentively the department of Progress in this JOURNAL, the form in which the matter is presented is convenient and the editorial comments judicious. We have during many years made use of the former issues for reference, and have invariably found that they were more satisfactory than some more pretentious, but less carefully selected, reviews.

R. W. W.

PROGRESS OF MEDICAL SCIENCE.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD W. WILCOX, M.D., LL.D.,

PROFESSOR OF MEDICINE AND THERAPEUTICS AT THE NEW YORK POST-GRADUATE MEDICAL
SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL.

The Treatment of Constipation.—DR. ALBERT ROBIN recommends sodium sulphate not only for its laxative properties, but because it relatively is peptogenic—seventy-five to one hundred and fifty grains in a half-glass of water during the meal. Magnesium hydrate if used for a long time is likely to irritate the bowels, cause colicky crises, and favor abnormal intestinal fermentation with increase of indican in the urine. Finally, it is strongly alkaline and may give rise to considerable magnesium carbonate, which may irritate the bladder. In spite of the usual repugnance to drastic cathartics, pills of aloes or of aloes and cinchona are useful. Socotrine aloes should not be specified, for none are to be found in commerce. Massage, which has for its purpose the emptying the large intestines, merits further use. Of the mineral waters, Châtel-Guyon, Brides, Aulus (source Darmagnac) are preferred. As for diet, it is important to note that many patients pass albumin in their urine two or three hours after eating, but not at other times. Therefore the amount of proteids should be limited to that which can be thoroughly oxidized.—*Bulletin Général de Thérapeutique*, 1898, 16e liv. p. 593.

Demorphinization.—M. PAUL SALLIER records the usual symptoms which appear when morphine-addiction is suddenly checked. Two theories have been advanced to account for these symptoms: (1) That morphine is changed by the oxygen of the blood into oxymorphine, which is poisonous. This oxymorphine is set at liberty when further ingestion of morphine is prevented, and causes the various symptoms. (2) Under the continued action of morphine the glands of the stomach cease to act. When morphine is taken away they recommence their activity, with the result that the stomach is inundated with acid gastric juice. This is the acid theory for the production of symptoms. The author presents his own: That morphine acts upon the glands in two ways: (1) Paralyzing the afferent nerves, and (2) impregnating

their cells. When morphine is stopped these glands renew their activity, although they are no longer in a normal condition. The cells of these glands and their excretory ducts are so modified that they are incapable of secreting readily, and they become swollen and painful. The retention of their contents is further embarrassed by the clogging of the ducts by detached endothelial cells from the glands and ducts. Later relief follows the evacuation of this material, with regeneration of gland and duct epithelium. This theory explains the eliminatory crises, the advantage of rapid removal of the drug, the uselessness and danger of so-called calmants and substitutes, and the severity of relapses during cure. — *La Presse Médicale*, 1898, No. 34, p. 201.

The Treatment of Inoperable Sarcomata.—DR. C. MANSELL MOULLIN has made use, in ten instances, of a fluid composed of the products of the growth of the streptococcus of erysipelas and the bacillus prodigiosus, sterilized by heat. After noting that the results obtained by different observers vary a good deal, the opinion of a committee appointed by the New York Surgical Society is quoted. They found: (1) That the danger to the patient from this treatment is great; (2) moreover, that the alleged successes are so few and so doubtful in character that the most that can be fairly alleged for the treatment by toxins is that it may offer a very slight chance of amelioration; (3) that valuable time has often been lost in operable cases by postponing operation for the sake of giving this method of treatment a trial; and finally and most important, (4) that if the method is to be resorted to at all it should be confined to the absolutely inoperable cases. The point, of course, is in the second finding. No one has ever advocated or practised this method upon patients who were suitable for operation. Some successful instances of the use of this method have been verified, and one single positive result is worth any amount of negatives. There are, however, certain conclusions which, though some of them may have to be modified later, appear to be justified at present: (1) It cannot be denied that there is a considerable number of instances in which sarcomata that had been given up as hopeless, often after repeated operations, have absolutely and entirely disappeared under this method of treatment. There is no other method of treatment (except infection with the streptococci of erysipelas itself) of which this can be said. (2) Some of these patients have remained free from recurrence for upward of three years, the period which, in the case of excision of the breast from scirrhus, is regarded by many operators as justifying the use of the term cured. (3) In several of the instances in which sarcomata have disappeared after an attack of erysipelas the patients have remained free from recurrence for seven years and upward. (4) The fact that there may be a few, a very few, instances recorded in which sarcomata have disappeared, either spontaneously or after such diseases as acute specific fevers, has nothing to do with these conclusions. (The statement that sarcomata do occasionally disappear is repeated with great regularity, but well-authenticated cases in which this has taken place are very difficult to find.) (5) Nor are these conclusions in any way invalidated by the fact that injections of the mixed toxins are sometimes followed by the disappearance of other growths, such as lupus, keloid, syphilitic deposits, carcinomata, etc. It may make the disappearance of sarcomata more difficult to understand, but it in no way disproves it. (6) The pro-

portion of instances of sarcomata that are cured by the injection of the mixed toxins depends among other things upon the histological character of the growths. Spindle-celled sarcomata are by far the most successful. This suggests the conclusion that the mixed toxins have a selective action even if it is not specific. (7) The disappearance of sarcomata is not due to inflammation, but to an intensely rapid form of fatty degeneration comparable only to that which affects the hepatic cells in acute yellow atrophy of the liver. Inflammation and sloughing, when they do occur, are septic complications. (8) Degeneration and absorption may occur whether the toxins are injected directly into the tumor or into some distant part of the body. In the former case, however, the effect is more rapid and the constitutional symptoms more severe. (9) The method is attended by a considerable degree of danger. It should, therefore, only be adopted in those cases for which there is no other remedy. The chief risk appears to be from collapse and pyæmia. There must always be danger of the latter if there is a suppurating or a sloughing sore. It may be argued that patients whose lives are immediately threatened by a malignant growth will never be cured by any remedy that does not involve some degree of risk. (10) The toxins are of no use unless the cultures are taken from a virulent case of erysipelas or are made virulent by passing the streptococcus through rabbits. (11) The bacillus prodigiosus, in spite of theoretical objections, has the effect of immensely increasing the reaction. (12) The effect is most striking in the case of rapidly growing sarcomata. Slowly growing ones appear to have much more resistance. Probably this merely means that masses of embryonic cells with little organization give way to injurious influences more readily than those that are more closely knit together. (13) Patients often gain in weight and strength while under treatment. (14) Treatment should be continued until the whole growth has vanished or has become so small that it can be removed. (15) If there is a recrudescence of the disease it does not follow that the toxins will be as efficacious the second time as they were the first. Whether this is the result of tolerance having been established cannot be said. (16) Recurrence in other parts of the body may take place after many years. (17) The severity of the reaction is very variable. Probably this depends upon the rapidity with which the injection is absorbed rather than upon any cumulative action it may possess. Coley suggests that injections of the mixed toxins may be useful in preventing recurrence after sarcomata have been removed by operation. Incidentally it may be mentioned that injections of the streptococcus of erysipelas apparently never cause suppuration. If, therefore, the streptococcus of erysipelas is identical with the streptococcus pyogenes the name of the latter had better be changed.—*The Lancet*, 1898, No. 3884, p. 354.

Soluble Metallic Silver.—DR. B. CRÉDÉ presents the formula of *Unguentum Crédé* as follows: 15 per cent. of soluble silver is incorporated in lard by the same method as is the mercury in gray ointment, and to the product 10 per cent. of wax is added. The ointment is flavored with benzoinated ether. From twenty to thirty minutes are required for inunction. This ointment is useful in acute suppurative processes, as phlegmon, lymphangiectasis and lymphadenitis, septicæmia, commencing osteomyelitis, phlegmonous angina, furunculosis, erysipelas, puerperal fever, gonorrhœal and articular rheuma-

tism. In general sepsis, or when inunctions are not practicable, it may be given internally as a pill: soluble silver, $\frac{1}{6}$; sugar of milk, $1\frac{1}{2}$ gr.; glycerin, $1\frac{1}{2}$ m., with sufficient water. Two of these may be administered twice or thrice daily, followed by from three to six ounces of boiled water or tea. These are suggested as being tonic, do not interfere with digestion, and in addition to sepsis may be of use in tuberculosis. Pencils of three grains each are useful for fistula. In solution, 1 or 2 to 10,000, it may be used for irrigation. Of the strength of 1 to 500–2000, in severe sepsis it can be administered intravenously after the method employed by Baccelli for mercurial solutions. Several patients have been under observation who have received fifteen grains of this substance daily for weeks without unpleasant after-effect or the appearance of argyria.—*Klinisch therapeutische Wochenschrift*, 1898, Nos. 14, S. 460, 15, S. 495.

[This allotropic form of silver has been known to photographers, notably H. Carey Lea, for many years. From the therapeutic stand-point it has a peculiar interest. Several months ago a hospital patient who presented numerous pustules upon the cheek and neck, the result of a suppurative otitis media, was entirely relieved by the use of the ointment, even before the ear was cured. We are of the opinion that this substance merits further investigation.—R. W. W.]

The Abortive Treatment of Erysipelas.—DR. LABIT recommends a 10 per cent. solution of iodol in collodion. The affected area is thoroughly painted with this and the coat extended for an inch over the healthy skin. If the hairy scalp is invaded, it is first carefully shaved, then painted. That the iodine contained in the iodol is absorbed is shown by its appearance in the urine. Frequently within twenty-four hours all symptoms of the disease will disappear. It is not claimed that iodol is the only specific for the streptococcus of Fehleisen; doubtless other antiseptics can produce the same result. The pressure produced by the collodion, and its penetration, carrying with it the remedy into the tissues, is important. The method is not painful, but, on the contrary, is anodyne. The results tend to show that at first the disease is local, and, since this is so, no general treatment has been employed.—*Bulletin Générale de Thérapeutique*, 1898, 14e liv. p. 540.

The Action of Organs upon Strychnine.—M. H. ROGER takes as his text the well-established fact that different parts of the organism possess the property of arresting alkaloids, modifying them, and diminishing their toxicity; in fine, of exercising a protective action against poisoning. The results of his experiments show that strychnine is about three or four times less poisonous when it is passed through the lungs than when it enters directly into the systemic circulation, as when injected directly into the aorta. This is, however, a special instance of a general law, for the function designated as antitoxic is not the exclusive property of a single organ or tissue. While all the organs, tissues, and cells may be capable of combating intoxication, there are certain parts of the organism which, because of their activity or their situation, are of principal importance. For instance, if a poison is introduced into the alimentary canal it is modified by the intestinal epithelium; if it passes this barrier it finds in the liver a most efficient protector

of the organism. In fact, in this respect no other organ compares with it. If, however, some portion of the poison has escaped its vigilance it is carried by the blood current into the lungs, whose protective action has been mentioned above. As it passes through this organ it is then distributed throughout the economy. If, on the other hand, absorption takes place from the peripheral veins, that is from subcutaneous injection, the liver acts too late, and it is the lung, the first organ traversed, upon which devolves the rôle of protector. This function of the lung deserves further study.—*La Presse Médicale*, 1898, No. 32, p. 185.

The Treatment of Bradycardia.—DR. R. DOUGLAS POWELL points out that one form sometimes follows upon the rapid heart of exophthalmic goitre. It is very commonly associated with well-marked myxœdema, and may continue, notwithstanding the disease has been cured or held in check by thyroid treatment. When found in epileptics the rhythm is not only slow, but frequently irregular. As a temporary condition it is not infrequently met with as a sequel to influenza, and also in association with the stage of depressed temperature that frequently follows upon other fevers. Chronic high arterial tension is generally associated with a slow, sometimes very slow, pulse, whereas in acutely raised tension the action of the heart is generally quickened. In chronic bradycardia, a condition that tends to remain permanent and does not necessarily shorten life, an occasional twenty-four hours' rest in bed should be enjoined, and for mental work the recumbent posture should be preferred. In the more temporary variety the combination of strychnine with an alkali or potassium iodide (the two drugs being kept in separate bottles) is a very useful one. Caffeine also may be employed, especially if the urine is scanty. A five-minute inhalation of oxygen three or four times daily is a valuable cardiac stimulant. In myxœdema thyroid extract will be given, but it is not wise to push it to the production of any excitement of circulation.—*British Medical Journal*, 1898, No. 1943, p. 805.

Acetylene; the Dangers Arising from its Inhalation.—DR. THOMAS OLIVER has directed his experiments toward an investigation of the poisonous properties of this new illuminant, when inhaled, as compared with coal-gas. In the latter death supervenes by asphyxia, owing to the carbon monoxide, so largely present in this gas, entering into stable combinations with the hæmoglobin of the blood, from which it is with difficulty dissociated. If a rabbit is placed in a bell-jar into which ordinary air and acetylene are pumped, the animal seems for a very long time to experience very little inconvenience. It is not until ordinary atmospheric air is excluded and only acetylene admitted that symptoms gradually and slowly develop. This circumstance shows that so long as there is any oxygen in the aerial medium by which the animal is surrounded, it is the oxygen which is absorbed in the blood, and very little acetylene. After a more lengthened exposure to acetylene than that which is necessary for coal-gas, the animal becomes intoxicated, it falls over on its side, apparently profoundly asleep, and while all through the experiment its breathing has been somewhat short and rapid, stupor steals over the animal, apparently painlessly, for there is not exhibited anything of the excitement, nervous or respiratory, which is seen in the narcosis produced by

such poisonous vapors as carbon bisulphide or benzole, or even in ordinary asphyxia. Where somnolence has been induced and asphyxia not pushed too far, the rabbit, when removed from the bell-jar and placed in ordinary atmospheric air, begins to move about in a few seconds in as lively a manner as if it had not been interfered with, there being neither weakness nor paralysis of its limbs. In a word, a few inhalations of atmospheric air are sufficient to restore to the animal all its faculties. Should the inhalation have been pushed further, and the animal have been very deeply asphyxiated, death may ensue, the cyanosis hitherto observed being rapidly replaced by extreme pallor. In the minor and easily recoverable stages of asphyxia the vascular tension is still maintained, and there is no difficulty in obtaining a drop of blood for examination; but when the deeper stages are reached, so extremely contracted are all the vessels that it is almost impossible to obtain even a trace of blood. When this stage has been reached recovery is difficult. It is interesting at this point to mention that when the blood of a rabbit at different stages of intoxication from acetylene is examined, and especially in the deepest asphyxia, this fluid on spectroscopic examination always exhibited two well-marked bands of oxyhæmoglobin; also that, unlike the blood in coal-gas poisoning, although resembling it in the cherry-red color which it presented, it was readily reduced on the application of ammonium sulphide and gentle heat. To that extent, therefore, if the asphyxia caused by acetylene is not too profound—and under ordinary domestic circumstances it would not be a pure acetylene atmosphere that would be inhaled by an individual, but one mixed with a large proportion of ordinary air—the danger to life seems to be less than it would be in coal-gas poisoning, and the prospect of recovery by removal to atmospheric air greater. Death may supervene, however, if the inhalation has been lengthened and atmospheric air excluded. A rabbit which was profoundly asphyxiated by acetylene, whose lips were extremely pale, its arteries comparatively empty, pupils widely dilated, breathing short and irregular, and muscles completely paretic, died after removal from the bell-jar, death being preceded as in anæmia of the brain, by opisthotonos and convulsion, first in one of the forelimbs, then of the hind, and subsequently the tremors became general. The rabbit died long after its removal from the acetylene atmosphere, after it had been breathing for twenty minutes ordinary air superficially and irregularly. The condition of the heart found at the necropsy is scarcely that observed in asphyxia; some other factor, therefore, contributed to the death of the animal.—*British Medical Journal*, 1898, No. 1947, p. 1069.

An Eruption Due to Exalgin.—M. G. LINOSSIER remarks the great rarity of cutaneous manifestations after ingestion of this drug. This patient, who could not take antipyrin because of the erythema which it caused, received about four grains of exalgin for the relief of headache. An hour after a general erythema appeared. The following day the body was covered with round, brilliantly red, papular areas of considerable size. Upon the back of the hands and in the digital interspaces the elevations seemed to be ecchymotic. Later the epidermis was separated and bullæ containing a colorless liquid appeared. Pressure upon the papular areas caused severe pain, although there was no marked itching. After the bullæ disappeared severe pain was

felt at their site. There was also marked burning pain throughout the entire length of the alimentary canal, and erythematous patches were seen upon the gums. All these manifestations disappeared within three or four days.—*Bulletin Générale de Thérapeutique*, 1898, 13e liv. p. 492.

Bacteriuria.—DR. EDMUND BONN reports an instance of chronic deep urethritis and follicular prostatitis. He administered internally sodium salicylate, benzoic acid, and salol, with large quantities of water (three pints to two quarts), and finally irrigated the bladder with potassium permanganate (1 to 1000) and corrosive sublimate (1 to 10,000). These were unavailing. The best results were obtained by the use of diuretic infusions and fifteen to thirty grains of urotropin daily, although even this did not entirely clear the urine.—*Prager medicinische Wochenschrift*, 1898, No. 18, S. 208.

The Applications of the Gastric Juice of the Dog.—M. FRÉMONT has obtained benefit from this substance in cholera nostras, chronic enteritis, and old dyspepsias. Several excessively emaciated patients gained weight rapidly. This remedy is contraindicated in the presence of an excessive amount of hydrochloric acid and in cancer. All of the patients treated had been for some time upon a regulated diet without benefit. Suggestion would not explain the beneficial results because the majority of patients did not know what they were taking. The juice was administered during the meal either clear or in beer. The doses varied according to the acidity of the stomach-contents of the patients. The average dose was two ounces.—*Le Progrès Médical*, 1898, No. 18, p. 281.

MEDICINE.

UNDER THE CHARGE OF

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Cancer of the Œsophagus.—HUBER has reported a case with some unusual features. The patient, a restaurateur, aged fifty-five years, began to complain of weakness and of piercing pain on swallowing. For years he had had attacks of an anginose character, frequently associated with hystero-epileptic paroxysms provoked by acute alcoholism. The patient was weak and emaciated, the pupils were contracted, and reacted to accommodation, but not to light. The reflexes were normal. Solid food could not be swallowed. On attempting to swallow milk, a coughing paroxysm was excited and most of the milk vomited. Examination of the pharynx showed a dilatation of the lower end, containing food-remains and mucus. The right vocal cord was

immobile, the left partly so. The œsophageal sound encountered an obstruction in the beginning, after passing which the rest of the œsophagus was traversed with ease. The first thought, that the case was one of cancer of the œsophagus growing into the larynx, seemed untenable, because of the impossibility of demonstrating a tumor by the usual methods of diagnosis. The suspicion of *tabes dorsalis* was entertained, and hysterical spasm of the œsophagus seemed probable. Applications of cocaine caused a diminution of the dysphagia. Examination with the œsophagoscope, however, showed thickening and redness at the level of the cricoid cartilage, without ulceration, infiltration, or constriction. Electrical treatment was followed by still further improvement of the local symptoms, but the progressing emaciation made the diagnosis of malignant disease most probable, notwithstanding. Laryngeal stenosis came on, followed by coma. Tracheotomy was made, but death ensued. Autopsy showed cancer of the œsophagus, growing into the muscles and cartilages of the larynx. Ulceration had been followed by phlegmonous inflammation of the larynx, without rupturing the mucous membrane of the latter.—*Berliner klin. Wochenschrift*, 1898, No. 24.

The Reserve Force of the Hypertrophied Heart, and the Significance of the Diastolic Expansibility of the Heart.—HASENFELD and ROMBERG have made extensive investigations which throw a great deal of light on many important problems in human pathology. Among the results the following may be cited: The degree of cardiac hypertrophy in valvular disease depends not on the duration, but on the extent of the insufficiency. In aortic insufficiency of slight or moderate degree, dilatation and hypertrophy of the left ventricle are the only consequences. If the lesion is more severe, the insufficient dilatation of the left ventricle causes increased pressure in the left auricle, with hypertrophy of that and of the right ventricle. The total strength of the heart is thereby increased. The organ compensates for the valvular lesion, and has, in addition, the same reserve force as a normal heart. However, this reserve force cannot be used to the proper effect, on account of the poor expansibility, the insufficient diastolic adaptability of the left ventricle. In aortic insufficiency the arteries undergo anatomical alterations in proportion to the extent of the valvular lesion, their elasticity being lessened. This involves corresponding loss of function.

Intermittent Argyll-Robertson Pupil in Tabes Dorsalis.—EICHHORST (*Deutsche med. Wochenschrift*, 1898, No. 23) publishes two examples of this. Its rarity is shown by the fact that it is hardly mentioned by writers, and the author himself saw no other example in 103 cases long observed in his clinic. Both patients were women, thirty-eight years of age. In both cases there were evidences of syphilis, and the symptoms of *tabes* were plain. The pupil reflexes varied under continued observation and notwithstanding steady progress of the disease.

Ascarides in the Bile-ducts.—MERTENS (*Deutsche med. Wochenschrift*, 1898, No. 23) reports an interesting case in which the diagnosis was made during life. A woman, aged thirty years, who had had two attacks of biliary colic, was seized with colicky pain in the right side, with bilious vomiting, followed

in a week by jaundice. On admission to the hospital the gall-bladder could be made out by percussion ; it was not sensitive. The liver and spleen were enlarged. The symptoms grew worse ; pleurisy, with effusion, developed on the right side ; later, ascites and œdema of the legs appeared. The jaundice was intense, the stools thin, with very little bile pigment and much free fat. Seven weeks after the beginning, after all the symptoms mentioned had become more pronounced, two ascarides were found in the stools. Both were macerated, and one of them showed a constriction about its middle. From that time the symptoms rapidly improved, though convalescence was delayed by a double suppurative parotitis. The author discusses the case with reference to the literature. In his own case he thinks the entrance of the worm into the duct was assisted by dilatation of the common duct from the previous passage of gallstones. Out of forty-eight cases of round-worm in the bile-ducts, there was a history of gallstone in only five. The present case is the only one followed by recovery, if we exclude the one of Dunkel, in which a round-worm was found in the pus of an operated liver-abscess. Besides these, only one other case is reported in which a diagnosis was made during life. In this, a five-year-old girl, with jaundice, pain, enlargement of the liver, and repeated chills, round-worms were vomited and passed with the stools. Death occurred from multiple liver-abscesses, the relation of which with the ascarides was made clear by finding dilatation of the duct post mortem. Mertens adds the history of a case in which ascarides wandered into the hepatic duct post mortem.

The Diagnosis of Œsophago-tracheal Fistula.—KOHLENBERG (*Deutsche med. Wochenschrift*, 1898, No. 23) had an opportunity of demonstrating on a case a method of diagnosis suggested by experiments of Gerhardt and others. An ordinary stomach-tube is introduced into the œsophagus, the upper window of the tube directed forward. The tube is passed down with short interruptions, while the patient makes deep inspirations and a lighted candle is held at the end of the tube. Under ordinary conditions the flame is blown gently in and out, but if there is a communication between the trachea and œsophagus the flame will be blown out when the opening of the tube comes opposite to the fistula.

Lymphadenoma and Rickets in a Child of Eighteen Months, Simulating Leukæmia.—H. D. ROLLESTON and A. C. LATHAM have observed a case of this kind, but, as the child was in the hospital only two days before death, it was impossible to make the examination as complete as could be wished. The child had granulation polypi in the ears, and began to be pale and weak after an operation on one of these two months before death. It was said the child "brought up blood," and, a week before death, petechiæ appeared in the skin. The spleen was enlarged ; there was a painful swelling on the right side of the neck. Death followed from asthenia. Cover-glass preparations of blood taken before death showed degeneration of the red cells and increase of leucocytes. A differential count of the latter gave lymphocytes, 61.1 ; polynuclear, 16.5 ; eosinophile, 1.6 ; myelocytes, 20.8 per cent. While counting 500 leucocytes, 94 normoblasts and 6 megaloblasts were noticed ; many of them showed mitosis. There were no Charcot's crystals. The au-

topsy showed marked anæmia, rickets, enlarged glands in the neck, normal sternum, but excess of lymphocytes in the rickety parts and shafts of the ribs. The stomach had a number of polypoid growths scattered all over the mucosa, except for an inch or more around the pylorus. The growths were soft, white, not ulcerated, and reached the size of a small walnut, being larger near the cardia. The lower Peyer's patches were enlarged and eroded. The spleen was much enlarged, the pulp "inundated" with lymphocytes. The kidneys contained small lymphomatous growths, as did the liver, which, microscopically, resembled that in leukæmia. The authors discuss the case in an interesting way, concluding that it was one of lymphadenoma complicated by or induced by rickets. Under the circumstances, this is, perhaps, all that the data permit; but as the history, like that in some other cases of so-called lymphadenoma, suggests infection, it seems strange this was not considered.—*The Lancet*, May 14, 1898.

The Hæmolytic Properties of Bothriocephalus.—SCHAUMANN and TALLQVIST (*Deutsche med. Wochenschrift*, 1898, No. 20) published some observations that help explain the severe anæmia sometimes associated with the broad tapeworm. Schapiro first suggested that the parasite produced a poison which, absorbed by the blood, caused increased breakdown of the red blood-corpuscles, but, although Vlajeff attempted to isolate the poison by chemical methods, no positive facts have previously been available. The authors experimented on dogs, first by using worms from individuals with bothriocephalus anæmia, and, finding these successful, used parasites from patients without anæmia. The worms were administered either partly digested by trypsin, or rubbed up with salt solution, or merely chopped up. Filtered extracts were also injected subcutaneously with similar effect, without producing local irritation. By all the methods the results were practically the same. After the first dose a loss of corpuscles of from one to one and a half millions was observed. Later the reaction was less marked or absent, or there was even an increase of corpuscles and hæmoglobin. The fall in the hæmoglobin was not so great as that of the corpuscles. The relative decrease of red corpuscles was not so severe as that in the tapeworm anæmia in man, probably because lack of material prevented the experiments from being carried on a long time. There were general symptoms referable to anæmia. Post mortem, the bone-marrow was dark brownish-red; the liver and spleen gave a marked iron reaction. Rabbits seemed refractory to extract of the parasites, and their blood, unlike that of dogs, was not made lake-colored by contact with it. Control-experiments showed that neither intestinal bacteria nor male-fern extract accidentally taken with the worms had anything to do with the anæmia. The worm-extract was shown to vary in its globulicidal effect in the test-glass. This, and perhaps other as yet unknown factors, accounts for the small proportion of persons who develop anæmia while infected with broad tapeworm.

Dilatation of the Antrum Pylori and its Relation to Motor Insufficiency of the Stomach.—MICHAELIS has investigated this subject by distending the stomach with air, marking out the boundaries, especially by the aid of percussion, and tabulating the results. In this way he found that if the motor

power is seriously disturbed the right margin of the stomach extends further to the right than in stomachs with good motor power. With very rare exceptions, if the right margin is more than 9 or 10 cm. from the median line, the motor power is more or less defective. In all the cases examined the extension to the right was due to actual enlargement, and not to dislocation to the right, a possibility the author does not deny. There are cases of motor insufficiency, with very slight enlargement of the stomach downward, but extending far to the right, and cases with good motor power, but enlargement downward. These facts indicate that the lateral enlargement is to a certain extent independent of other alterations in the size of the stomach, and is in close relation with the motor power of the stomach. Michaelis ascribes the enlargement toward the right to a dilatation of the antrum of the pylorus. The peculiar anatomical and functional features of this part of the stomach make it clear that an enlargement of the stomach to the right should excite suspicion of a motor disturbance, the positive determination of which must be made out by functional tests.

Meningococcus Intracellularis in the Nasal Secretions of Healthy People.—The work of numerous observers made it appear that Weichselbaum's coccus occurs in the nasal secretions only in persons with meningitis. At all events, the exceptions were so rare that the finding of the germs in the nares seemed to have a certain diagnostic value. SCHIFF, however (*Centralblatt für inn. Med.*, 1898, No. 22), has made some observations which compel us to revise that opinion. He had a patient who was suddenly taken with symptoms of meningitis. The suspicion that the case was one of epidemic meningitis was strengthened by finding in the nasal secretions large numbers of diplococci having all the characteristics of the meningococcus. Lumbar puncture, however, showed the presence of tubercle bacilli and the absence of cocci, and the diagnosis of tubercular meningitis was soon confirmed by autopsy.

This experience led Schiff to examine the nasal secretions in twenty-seven patients with various chronic diseases. All had either normal conditions in the nose, or, at most, mild chronic catarrh. In seven of these meningococci were found, but in only three in large numbers, permitting culture. It seems probable, therefore, that the parasites occur often without producing severe infection, so that an individual or local disposition (solution of continuity, for example) must be supposed. This fact helps to explain the cases, not rarely observed, in which meningitis has followed injuries of the skull.

The author found in the course of his investigations that the reaction of the cocci to Gram's stain was variable, thus explaining the contradictory statements of previous observers. He also, like Kiefer (*AMERICAN JOURNAL OF THE MEDICAL SCIENCES*, October, 1896, p. 478), acquired a mild rhinitis, with the specific germs in the secretions, while carrying on his cultures.

SURGERY.

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Fracture of the Calcaneum.—TUFFIER and DESFOSSES (*La Presse Méd.*, April 13, 1898) report an interesting case of fracture of the calcaneum, in which by means of the x-rays they were enabled to see the mechanism of the fracture, which formerly a post-mortem examination was alone capable of showing.

The skiagraph shows that a triangular portion of the calcaneum, which contained the attachment of the tendo-Achilles, was torn away, evidently by muscular force applied to it through that tendon. The skiagraph also shows that the line of fracture corresponded to the lines of the structure of the bone, and that the break started at the point where the force was applied to the longitudinal fibres of the bone.

The Treatment of Anchylosis of the Jaw.—ROSER (*Cent. f. Chir.*, 1898, No. 5) reports a successful case in which he employed a method which he devised for the prevention of a recurrent anchylosis. After an excision of the articular surfaces of the lower jaw he interposed a thin sheet of gold moulded to fit the joint in a measure, and thus, while helping to hold the parts in position, it prevented the formation of a bony or fibrous union.

The method of interposing portions of muscular structures has been employed by others, but the use of metal for this purpose, the author believes, has distinct advantages. The result in this case was eminently successful, the patient retaining the original amount of motion attained.

The author believes this method of interposing a foreign substance may be readily applied to other joints in the production of artificial arthroses.

Transperitoneal Nephrectomy with Marsupialization of the Peritoneum.—In all cases where the increased size of the kidney makes it apparent that it will be impossible to remove it by the lumbar route, VILLARD (*Gaz. Heb. de Méd. et de Chir.*, February 6, 1898) advises the employment of the transperitoneal route, with the previous performance of marsupialization of the peritoneum in the following manner:

The abdominal incision is made over the external border of the rectus muscle, making it possible to avoid the colon and pass externally to it in reaching the kidney. The length of the incision depends on the size of the tumors.

As soon as the peritoneum is incised hæmostatic forceps are placed upon the serous margins, everting them. This wound has presenting in it the anterior surface of the kidney, which is incised about an inch exterior to the insertion of the colon, which in the decortication is displaced internally. The two margins of the incision in the peritoneum of the kidney are caught with hæmostats and dissected up slightly and united to the peritoneum of the parietes on either side along the entire margin of the abdominal incision. There has thus been formed an opening through the abdominal wall down to the kidney, with the peritoneal cavity entirely shut off from the wound. Through this opening the kidney can be readily removed without danger of infection.

In cases of malignant tumors of the kidney the nephrectomy should be extracapsular; in cases of suppuration try the same process, but remember that more frequently it will be necessary to do a subcapsular nephrectomy.

The Disinfection of the Field of Operation.—Numerous methods have been employed with varying success for the disinfection of the skin in the field of operation; it is known that the bacteria are held in the natural fats of the skin and that their removal is essential to the destruction of the germs. LANDERER and KRÄMER (*Cent. f. Chir.*, 1898, No. 8) find that methods heretofore employed are none of them entirely satisfactory, since in a large percentage of cases treated by any of these methods bacterial colonies are found in large numbers. These bacteria are also found in the glands of the skin as well as upon the surface, and a method to be successful must penetrate deep into the skin.

They propose the employment of a 1 per cent. formalin solution for this purpose, and their experiments show that 80 to 90 per cent. of the cases are absolutely sterile.

The technique of the method is simple: After an ordinary soap-and-water bath, a compress wrung out of 1 per cent. formalin solution is placed over the part protected by a water-proof covering and held in place by a moist bandage. The action commences at the end of six hours. The bandage is continued on an average of from twelve to thirty-six hours, and is renewed once or twice during that time. If it is allowed to remain more than two days the skin is hardened and primary union interfered with. The ordinary means of sterilization are employed just before the operation.

Three Cases of Nephrectomy for Pyelonephritis Followed by Recovery.
—COELHO (*Rev. de Chir.*, November 10, 1897) reports three cases of pyelonephritis in which the kidneys were so involved by the disease that nephrectomy was the only method of treatment that held out any chance of recovery.

The author does not believe that it will occur very often that three cases of pyelonephritis will be found that can be justifiably treated by nephrectomy. Many cases can be treated by medical means, and the great majority can be cured and leave behind, after a nephrotomy, sufficient functional ability in the kidney to be of great service.

The author does not believe that the good results which he has had in these three cases, the only ones he has operated upon, in any manner affect the

statistics or the gravity of this method of intervention, and says that he himself realizes more fully since these cases the gravity of the operation.

All three patients were between thirty and forty years of age; in all the pyelonephritis was of long standing; there was much difficulty encountered in each operation from the adhesions and connective tissues formed about the kidney and binding it down. The secretion of urine gradually increased in all the cases after the first twenty-four hours. The recovery was uneventful, with no fistula in any case. In all the cases the kidney was the seat of multiple individual abscesses of which, in instances, one or two communicated. There was, however, no microscopical secreting kidney structure remaining, the tissue being connective and adipose.

The Mechano-therapy of Movable Kidney.—ECCLES (*The Lancet*, January 29, 1898) says, of twenty-one cases treated by abdominal massage, exercise, rest, and an abdominal pad and belt, that the results obtained are for the most part so satisfactory that they bear favorable comparison with records of those treated by operation. Early diagnosis, reposition, and the maintenance of the organ in position by methods which also conduce to the improvement of the general health, would appear to go far toward the relief of the patient from the necessity of having the kidney stitched into its place or removed from the body. These cases should at least be subjected to this form of treatment before operation is determined upon; the time required is not wasted, as the patient is all the time gaining strength, and is in better condition for operation if it becomes necessary.

The author reports in detail seven cases, of which he says that in all there were physical signs, local and general symptoms which are attributable to the dislocation and mobility of the right kidney, and the results show that much suffering and chronic illness can be averted by means entailing none of the risks possibly incurred by operation.

In these cases of floating or movable kidney, no less than in other forms of enteroptosis with so-called functional disorder of digestion, the indications are to restore healthy tone and to induce the redeposition of fat and flesh to the abdominal walls, as well as to improve the nutrition of the viscera and replace the packing material of fat, which in many cases has vanished. This, he believes, is best secured by a rest-treatment, carefully regulated diet, exercise in increasing amount, while precautionary measures are taken to replace the kidney and keep it in proper position.

The Immediate Correction of Angular Deformity of the Spine.—CLARKE (*British Medical Journal*, February 12, 1898) was induced to try this method of treatment by the fact that after what was apparently a perfect cure by means of splints, and the spine was firm and free from tenderness, the slight curve that remained would gradually increase.

In a favorable case in a child, two and one-half years old, he performed forcible extension, straightened the spine, and applied a plaster jacket strengthened by iron bands. At the end of six weeks the plaster had to be removed, and it was found that most of the deformity had returned. The spine was again straightened and a plaster and metal apparatus so arranged that the spine was over-extended and extension could be applied to

the armpits and lower limbs. The patient was perfectly comfortable in this position for a month, when the spine was again examined. The deformity was certainly diminished, but not removed. The part was now free from tenderness, and on giving an anæsthetic it was found that there was now more resistance, pointing to some bony ankylosis having taken place, so the deformity was not corrected. The patient was replaced in the apparatus. A fortnight later a Chance's splint, with an occipital head support, was applied. Three and three-quarter months after the first operation the child could sit up without discomfort and without fatigue.

The author prefers the Chance's splint to Thomas's splint. The author's experience leads him to await the results of others before applying this method in his own cases further.

Trephining the Skull.—The various means now in vogue for trephining and the different processes by which large bone and skin flaps are raised in modern operations on brain tumors, are discussed at length by BRAATZ (*Cent. f. Chir.*, 1898, No. 3). He believes that the best method is by the use of Gigli's wire saw, which is passed between the dura mater and the bone, through small trephine openings or drill holes, which are placed at convenient intervals in the line of the flap which is to be removed.

The perforations through the skull, he believes, can be more readily made by employing a simple mechanical drill which he has devised for this purpose, than by the use of trephines or ordinary drills.

The use of the Gigli saw has the advantage of destroying only a small amount of bone substance, so that if it is desired the bone flap can be replaced. By making the cuts slightly bevelled the bone is prevented from pressing on the brain, while thin bone periosteal flaps may be made that will lap over the cut-out point, and thus securely close it.

A Case of Fatal Acute Dilatation of the Stomach Following Cholecystotomy.—FINGER (*The Clinical Review*, February, 1898) reports a case under the above title, from which he draws the following conclusions:

1. During the course of convalescence from some acute or chronic disease, the stomach may undergo rapid dilatation.

2. This condition is marked clinically by a sudden and violent onset; vomiting is violent and intractable: large quantities of fluid are ejected; the fluid is usually greenish, due to admixture of bile. The patient is reduced to a state of collapse or exhaustion, which may prove fatal in a few days.

3. During the progress of the disease the abdomen becomes distended, the right hypochondrium remaining flatter. The bowels move spontaneously, and a splashing sensation may be elicited over the site of the distention. Sensorium usually cloudy.

4. If treatment is unsuccessful the abdomen becomes more distended, vomiting ceases, and the patient dies of exhaustion.

5. Indications for treatment are:

(a) Supportive measures.

(b) Use of stomach-tube one or more times daily, as early in the case as possible.

(c) Rectal feeding.

(d) No food by the mouth until vomiting is nearly or quite controlled.

6. The treatment without lavage is unavailable, and use of narcotics worse than useless.

Four Cases of Gastro-enterostomy for Pyloric Cancer.—BARKER (*The British Medical Journal*, February 12, 1898) reports four cases in which operation was delayed too long to make recovery possible. The first died of shock, the second of inanition, perhaps aggravated a little by shock. The two last cases recovered thoroughly from the operation, the parts uniting perfectly, and leaving nothing to be desired as regards the function of the new openings. The third case was complicated by a stomach injured by dilatation and putrescence of food with bacterial fermentation. It was the seat of ulcers, one of which perforated an artery, causing fatal hemorrhage. In the last case, although the relief of symptoms after operation was most marked, the cancerous ulcer was too far gone in destructive change, and opened into the peritoneum just when we hoped the patient would be able to leave the hospital. The author operated upon two cases previous to these. One lived for a year and a week, and grew fat and strong enough to resume domestic duties, dying ultimately of generalization of the carcinoma. The second left the hospital improved and walking about. Some time after he died of a pneumonia. A post-mortem examination of the stomach showed a perfect union with the proper spot in the jejunum.

Of the six cases, two died directly after the operation. In the four others the operation was successful, but too long delayed to prove beneficial in two of them, as perforation followed.

The author prefers the use of the simple suture with fine silk to any other contrivance, and says he has then no fear of buttons falling into the stomach or becoming jammed in the intestine.

The Influence of the X-ray Method of Diagnosis upon the Treatment of Fractures.—In remarking on the benefits which this new method of diagnosis has conferred upon the treatment of fractures, LEONARD (*Therapeutic Gazette*, March, 1898) says: "It cannot be expected of any new method of diagnosis that it will replace or at first even equal methods which have attained accuracy and scientific precision by the study of generations of observers, and yet this new method of diagnosis has already produced results which markedly affect the treatment of certain forms of fractures."

The greatest value is in the determination of the exact nature of injuries and the point where danger is to be expected from exuberant callus, or the blocking of the joint by overlapping of the fragments. In many instances fractures that lie wholly within the capsule of the joint, and thus escape detection, are distinctly shown and are rendered amenable to treatment other than that for "bad sprains."

"Many fractures which have been described as rare have been shown by this method to have been rarely detected, while the exact determination of the form of fracture and the recognition of minute comminuted fragments have rendered coaptation more precise and the result of treatment more perfect."

One of the greatest influences of this method upon the treatment of frac-

tures is the change it is bringing about in prognosis. Antisepsis has robbed the compound fracture of its gravity, and the skiagraph has shown that in many cases the simple fracture is much more dangerous and liable to be followed by greater deformity and loss of function, and that its name is often a misnomer. The author advocates the change suggested by others, of the terms open and closed for simple and compound; and advises in many instances the treatment of simple fractures by open operation, claiming that under aseptic precautions there is no danger commensurate with the advantages gained.

Of the medico-legal value of the skiagraph he says: "There seems to be no doubt that the only ground for damages in suits for malpractice must be, as formerly, based upon expert testimony as to the amount of deformity and functional disability of the patient. . . . There is, however, reasonable ground for holding that unless a skiagraphic examination of the fracture has been made, or at least suggested by the practitioner and declined by the patient, it cannot hereafter be said that where functional disability exists the practitioner has employed all reasonable and ordinary means, to the best of his ability, in the treatment of the fracture."

OTOLOGY.

UNDER THE CHARGE OF

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Treatment of Chronic Purulent Otitis Media.—In speaking of the treatment of chronic suppurative ear-disease, R.H. WOODS (*Dublin Journal of Medical Science*, January, 1898) says it is the rule, rather than the exception, at least among the poor, to hear a mother excuse the neglect of her child's incurable ear by saying "she thought it would grow out of it," or "she was told it would be dangerous to stop the discharge." "I regret to say the doctor is often quoted as having originated or confirmed this view. That qualified men are to be found capable of committing themselves to statements such as these is a satire on examinations. Ignorance such as this can be combated only by the education of the profession and the enlightenment of the public."

MÜLLER (*International Medical Magazine*, December, 1897, p. 759) reports two cases of chronic purulent otitis media treated with *Koch's Tuberculin R*. One case was made worse by the treatment, apparently, and the other was not benefited by it.

Thorough cleansing, with antiseptics first, and then, if this is unavailing, removal of the membrana tympani, malleus, and incus, to improve drainage, is approved of by A. H. BUCK (*British Medical Journal*, November 27, 1897), MACCUEN SMITH (*Cinn. Lancet-Clin.*, July 24, 1897), E. B. DENCH (*Medical News*, July 3, 1897), C. H. BURNETT (*Internat. Med. Mag.*, December, 1897, and *Philadelphia Medical Journal*, February 26, 1898), and J. H. STUCKY (*Journal American Medical Association*, March 26, 1898).

Regarding this most important subject, N. H. PIERCE (*Journal American Medical Association*, January 1, 1898) states that he has "come to believe from experience that many cases of catarrhal inflammation assume a suppurative or chronic form because of ill-advised treatment. One of the most prevalent errors in this regard is the empiric and illogic use of ear-drops, douches, and inflations."

[The prime consideration in treatment of any form of otorrhœa, whether acute or chronic, is the promotion of drainage. In order to do this it is not necessary to do much in the way of local treatment, which, too often irritates, blocks the opening in the drum membrane, and thus interferes with drainage. The case is thus artificially thrown into a condition demanding treatment, especially if an *artificial* mastoiditis is set up, as is too often the result. We have yet to see, after twenty-five years' experience, an acute mastoiditis consecutive to an acute otitis media, in a previously healthy ear, that was not the direct result of *artificial* secondary infection.]

Illustrations of the evil results of neglected middle-ear suppuration, especially in children, are given by E. B. DENCH (*American Gynecological and Obstetrical Journal*, October, 1897).

Indications for Operation on the Mastoid and Tympanic Antrum.—RICHARD LAKE (*Medical Press and Circular*, January 19, 1898) gives the following indications for operation upon the mastoid and tympanic antrum: (a) 1. Acute otitis media suppurativa, with acute disease of the antrum. 2. Influenzal mastoiditis. 3. Secondary infection from meatal abscess. 4. Acute tuberculosis of the middle ear. (b) 5. Chronic otitis media suppurativa. 6. Acute exacerbation in chronic disease. 7. Periodic or constantly recurring discharge. 8. Facial palsy (in chronic cases, rare in acute). 9. Cholesteatomata of attic and antrum. 10. Vertigo on syringing. [Vertigo, when of a rotary and horizontal character, is considered by Lake a symptom "that the membranous external horizontal semicircular canal is exposed through caries of its bony wall."] 11. Persistent mastoid pain. 12. Contraction of the meatus. 13. Bezold's mastoiditis [with perforation of the medial plate, generally into the digastric fossa]. 14. Mastoid fistula. 15. Necrosis. (c) 16. As a preliminary to other operation. Lake also appends "a simple record of the means best calculated to avoid operation, as follows: 1. Incision of the membrane. 2. Boric fomentations. 3. Antiseptic irrigations of the meatus. 4. Leeches to the mastoid. 5. Leiter's coil, or external cold. Above all, avoid all blisters; they mask the symptoms, and give rise to false impressions, for pain is of necessity bound to be felt when one presses on a blistered surface, especially if, as here, over bone."

Chronic Mastoid Abscess, of three years' duration, in a child, aged five years, is reported by G. C. STOUT (*Philadelphia Polyclinic*, July 31, 1897) as cured promptly by removal of a large sequestrum through an incision over the mastoid.

That acute and chronic caries and necrosis of the mastoid, with their sequelæ of pachymeningitis externa and epidural abscess, are entirely reliev-able by prompt and thorough surgical intervention is shown by nine cases

operated upon and reported by H. KNAPP (*Journal American Medical Association*, March 19, 1898).

J. E. SHEPPARD (*Brooklyn Medical Journal*, July, 1897) has observed twelve cases of mastoiditis without or with but little involvement of the tympanic cavity, and MACCUEN SMITH (*Therapeutic Gazette*, August, 1897) also reports the observation of mastoid empyema without the usual objective symptoms.

That very often, in marked *external* symptoms of acute mastoiditis, mastoid trepanation is not finally demanded, is shown by cases reported by ADA AUDENRIED (*Philadelphia Polyclinic*, Nov. 6, 1897) and F. S. PARSONS (*Medical Times and Register*, March 12, 1898). Also that in many instances in which the symptoms are supposed to indicate mastoid trepanation, and even cranial-mastoid trepanation, for the relief of a supposed otitic lesion of the brain, all these symptoms will subside and the patient recover without operation, is shown by cases reported by H. WOODS (*Journal American Medical Association*, March 19, 1898).

After-treatment of the Exposed Middle-ear Cavities.—E. WINCKLER (*Münchener med. Wochenschrift*, Nov. 30, 1897), in discussing the various ways of bringing about the formation of normal epidermis in the wound cavity produced by the surgical exposure of the middle-ear cavities, believes that the impartial judge will decide that “just as the extent of the operation in every instance must be determined by the nature of the symptoms, so, too, must the after-treatment be instituted according to the extent and conditions of the wound produced.”

Otogenous Abscess in the Right Temporal Lobe of the Brain.—Small abscesses in the temporal lobes, and abscesses in the right temporal lobe, may run their course without central symptoms, as shown by OPPENHEIM (*Nothnagel, Spec. Path. u. Therap.*, 1897). Optic acoustic aphasia is the usual symptom of abscess in the left temporal lobe. The same symptom may be present with an abscess in the right temporal lobe of a *left-handed* subject. However, the diagnosis of an abscess of the right temporal lobe is far more difficult than that of the left, since the physician must be guided by the existence or discovery of symptoms that are termed indirect, or symptoms of contiguity, as shown by E. KALMUS (*Prager med. Woch.*, December 23 and 30, 1897), in reporting a case in the practice of Prof. Pica. In such a case there must be considered the not uncommonly observed hemianopsia, various phenomena of motor paralysis, and irritation, as facial and facio-brachial paresis, hemiparesis, hemiplegia, and spasms of one side of the body. Kalmus further shows that in such a case is found conjugate deviation of the head and eyes, as pointed out by Jansen, Oppenheim, H. Jackson, Zaufal, and Pick. Rarer manifestations are disturbances in sensibility. Partial and complete oculomotor and abducens paralyses are sometimes observed, as are also the rarer occurrences: nystagmus, singultus, photophobia, absence and increase of patellar reflex of the affected side, strangury, and involuntary urination and defecation, as shown by Körner. But all of these indirect symptoms may be absent or so unpronounced as to be easily overlooked. There may be, also, in addition to the above-named symptoms,

elevations of temperature, increased frequency of respiration, *relatively low pulse*, lagophthalmus on the opposite side, protrusion of the eyeball on the side of the abscess (right), with narrowing of its pupil. In Pick's case of otitic abscess of the right temporal lobe, in which there was ambilateral chronic otorrhœa, reported by KALMUS (*Münch. med. Woch.*, December 23 and 30, 1897), the diagnosis of the locality of the abscess was based upon the paralysis of the left facial and hypoglossus nerves, the weakness of the left arm, the occasional spasmodic pronation and supination occurring in it, paresis of the left leg, lateral homonymous hemianopsia on the left side, conjugate deviation of the eyes and head toward the right. The intermission observed in these symptoms of paresis and hemianopsia during the week the patient was under observation in the hospital is ascribed to their being indirect central symptoms, since, had the lesion of the optic radiations been a direct one, the hemianopsia would have been permanent. The abscess-cavity, extending from the posterior two-thirds of the temporal lobe to the anterior part of the occipital lobe, measured 7 cm. in length and 3 cm. in its greatest diameter. There were destructive necrosis of the tegmen tympani, and purulent, ichorous infiltration of the bone near it in the tract of the large wing of the sphenoid, of the posterior part of the right frontal squama, and also of the anterior inferior angle of the right parietal bone. An operation was declined in this case. The diagnosis was established at the autopsy.

Paracentesis of the Membrana Tympani.—All aurists of experience will agree with J. GRUBER (*Medical Press and Circular*, January 5, 1898), that paracentesis of the membrana tympani is indicated "whenever any inflammatory products are satisfactorily diagnosticated to be present in the middle ear. For this purpose the knife is vastly preferable to the galvanocautery, as the latter method produces a large destruction of the membrana, healing very slowly." The wide, semicircular incision around and posterior to the manubrium, with the minor adjuncts of suction in preference to compression (inflation) for the removal of fluid from the tympanum, are recommended by Gruber. He further maintains that "great prudence should be exercised in the use of the air douche (inflation), as any infectious matter may be driven back into the mastoid cells, where a new source of trouble will start, leading on to mastoiditis and, probably, terminating with serious consequences."

The objections to paracentesis in ordinary acute otitis media urged by R. H. WOODS (*Dublin Journal Medical Science*, January, 1898) are founded on the observation of a large number of cases of what he terms "acute otitis media without pain."

[Cases answering to this description must have been instances of myringodermatitis, or myringitis, rather than otitis media, such as have been described by J. E. SHEPPARD and C. H. BURNETT (*Year-book of Medicine and Surgery*, 1898) and by R. W. SEISS (*Journal American Medical Association*, March 19, 1898). In any case of accumulation of fluid in the drum-cavity, especially if pain or dulness of hearing, or both, are present, prompt paracentesis is indicated. If the fluid in the drum-cavity is not thus let out, it may organize and lead to synechiæ. If myringodermatitis occurs,

and if a bleb forms on the membrana, the former may be punctured if pain is great; otherwise it may be let alone, and spontaneous rupture or absorption awaited. In puncturing a bulla or a bleb of the membrana, care must be taken not to puncture the inner wall of the sac, for if this inner wall is punctured the infectious contents will pass into the drum-cavity and inoculate it.—ED.]

DERMATOLOGY.

UNDER THE CHARGE OF

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Treatment of Epithelioma by Arsenical Solution.—BORDE (*Annales de Dermatologie et de Syphiligraphie*, 1898, No. 2), at a meeting of the Société de Médecine et de Chirurgie de Bordeaux, reported a case of epithelioma, in which a recurrence had taken place after surgical interference, treated by painting the point of implantation of the tumor with Czerny's solution of arsenic. These applications were made every two days, and in a short time a cure had taken place.

DAVEZAC presented to the same society a patient, aged eighty-three years, who had had an epithelioma of the nose for about one year, in whom recurrence had taken place after thorough treatment with the thermo-cautery. A cure was obtained by the application of Czerny's solution.

Ulcerations Due to the Bacillus Pyocyaneus.—TRIBOULET and TOLLEMER (*Annales de Dermatologie et de Syphiligraphie*, 1898, No. 2) reported at a séance of the Société Anatomique de Paris a case of an infant, aged ten months, which suffered from disseminated, cup-shaped and round ulcerations. Cultures prepared from these lesions revealed the presence of the bacillus pyocyaneus. At the autopsy, blood from the heart was found to contain the same organism. Sections of the skin showed that the bacilli were present only in the superficial layers of the derma, the capillaries being free from them. From these facts it would seem that the cutaneous ulcerations were the port of entry for the bacillis which caused the septicæmia.

A Case of Monilethrix with Unusual Distribution.—GILCHRIST (*Journal of Cutaneous and Genito-Urinary Diseases*, April, 1898) reports the following case: A young man, aged twenty-eight years, first noticed at the age of seventeen two symmetrical bald patches on the anterior surface of the legs. There were no subjective symptoms. These two patches gradually increased in size, and were followed by other symmetrical patches on the thighs and calves about two years after the first appearance of the affection. Microscopic ex-

amination of the diseased hairs revealed a well-marked nodular appearance. Sections of the skin taken from the margin of a bald area showed the following changes: The epidermis was thinner than normal, and the follicles presented marked alterations, the mouths being the seat of a hyperkeratosis. In the corium were numerous connective-tissue and lymphoid cells. Culture experiments failed to reveal any organism. The author's conclusions concerning the malady are as follows: Clinically, pathologically, and bacteriologically it is distinct from trichorrhæxis nodosa. It originates in the hair-follicle near to the papilla. The corium around the follicle is the seat of chronic pathological change. The hair-shaft is secondarily affected, and the follicular hyperkeratosis is likewise a secondary process. The disease is probably trophoneurotic in origin.

A Case of Keratosis Follicularis.—BOWEN (*Annales de Dermatologie et de Syphiligraphie*, 1898, No. 1) reports a case of this disease limited to the head and hands. The patient was a woman, aged thirty-three years, whose family was free from cutaneous disease, except the mother, whose hands were said to resemble those of the patient. The skin of the face was thick, greasy, and of a brownish tint, especially marked on the temples and at the margin of the scalp. The face was the seat of a great number of small papules, some of which had a depression in the centre in which was a small fatty plug. The lesions were most marked behind the ears, where they were entirely characteristic, and were much larger than those upon the face. In some places the lesions were confluent, and behind the ears presented an irregular papillomatous aspect. The scalp was covered with fatty crusts and scales, differing from the crusts and scales of seborrhœa in that many of them were contained in depressions from which they could readily be removed. Upon the dorsal surface of the hands were numerous small, firm papules of the color of the normal skin, covered with a thick corneous layer which gave them a verrucous aspect. The remainder of the cutaneous surface was entirely free from disease. Examination of excised lesions showed appearances typical of keratosis follicularis. Prolonged employment of stimulating and keratolytic ointments produced marked amelioration of the disease.

The Best Form of Mercurial Inunction Cure.—UNNA (*Monatshefte für prakt. Dermatologie*, January 15, 1898) calls attention to the fact that the use of "mercury-salve soaps" for the purpose of inunction is not new, as claimed by some, but has been employed by him uninterruptedly since 1884. The advantages of this form of inunction have been put forward in the work of Dr. Leistikow (*Therapie der Hautkrankheiten*, Hamburg, 1897), recently recorded in the JOURNAL, based upon treatment with 4000 cases. Unna considers that this method is more agreeable and convenient to patients than that of mercurial ointment, and that from the physician's stand-point it acts energetically upon all varieties of syphilitic lesions, and more rapidly than mercurial ointment. Further, that mercurial ointment is rubbed in satisfactorily only in subjects with a markedly fatty skin, while the "mercurial-ointment soap" is well adapted to all conditions, acting more energetically and surer upon deep-seated local lesions than mercurial ointment, and that

it is particularly indicated in glandular swellings and bone affections. The "gray soap" (*sapo cinereus*) recommended contains, as in the case of all "ointment-soaps," a cooked potash solution and fat, with 5 per cent. benzoated fat superadded to the body of the soap, with which is incorporated half its weight of quicksilver. For an active course of inunction about a drachm is used daily; for a mild course from fifteen to thirty grains. The application is allowed to remain on the skin about a week. It does not stain the linen appreciably.

Prophylaxis of Leprosy.—HANSEN, the noted leprologist (*Monatshefte für prakt. Dermatologie*, Bd. xxv., No. 9), concludes his article by stating that in all countries where leprosy is met with endemically, isolation has proved the most useful method of preventing the spread of the disease, and, in the light of Norway's experience, is to be commended. While the lepra-bacillus is the true cause of the disease, the conditions of life and the way in which the bacillus enters the body are unknown; but Hansen thinks it probable that the mouth and nasal cavities are the avenues of entrance. Leprosy is contagious, but not hereditary. The worse the social relations the greater is the danger from contagion. Up to the present time the disease has resisted all manner of treatment looking to a cure.

OBSTETRICS.

UNDER THE CHARGE OF

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Four Cases of Cæsarean Section for Osteomalacia.—In the *Monatsschrift f. Geburtshülfe und Gynäkologie*, Band vii., Heft 6, 1898, SIEBOURG reports four Cæsarean operations for osteomalacia. The first patient was twenty-six years old and had borne six children. During her third pregnancy she began to have pain in the legs and sacrum, and these symptoms became worse in subsequent pregnancies. She finally was unable to walk or stand and was very much reduced.

On examination the characteristic signs of the disease were present in the pelvis and very well marked. As the child's heart-sounds were strong and clear, it was determined to deliver the patient by Cæsarean section. This was done by amputating the uterus and stitching the stump at the lower end of the abdominal incision. The patient made a good recovery and became able to walk, and was entirely relieved of her pain. At the time of operation she suffered from a severe bronchial catarrh, which also disappeared.

The second patient was thirty-seven years old, and gave a history of having suffered for six years with osteomalacia. The patient had been three years

in bed. Characteristic signs and symptoms of the disease were very clearly present. The heart-sounds of the child were plain, and it was determined to perform Cæsarean section, and in addition to entirely remove the uterus. This was done in the usual manner, although difficulty was found in checking the bleeding because of the relaxed condition of the tissues in the broad ligaments. The patient had hemorrhage after the operation, and perished in collapse. Abdominal section showed a considerable amount of blood in the abdomen, which had apparently oozed from the stumps of the broad ligaments.

Case third, aged thirty-nine years, had borne four children without assistance. During the third pregnancy symptoms of osteomalacia appeared, and were aggravated during the fourth pregnancy. She suffered severe pain in the sacrum and legs, and the pelvis was greatly deformed. The child was removed by transverse incision across the fundus. The uterus was amputated and the stump stitched in the lower end of the abdominal incision. The patient made a good recovery from operation and her pain was relieved.

Case fourth was in her eighth pregnancy, having passed through seven normal labors. Five years previous she had noticed symptoms of osteomalacia, and these had steadily grown worse. As the patient was highly deformed, Cæsarean section was chosen and the uterus amputated and its stump fastened in the lower end of the abdominal incision. This patient made a good recovery and was relieved of her symptoms.

Siebourg considers total removal of the ovaries, tubes, and uterus to be the best operation in these cases. His good results with amputation and stitching the stump in the abdominal incision lead him to advise this in cases where for any reason total removal of the uterus cannot be performed.

Incarcerated Ovarian Dermoid Removed During Labor.—In the *Transactions of the Obstetrical Society of London*, vol. xl., Part I., SPENCER reports the case of a patient, aged twenty years, who had had one dead child previously without difficulty. With the second child the labor was obstructed by an ovarian dermoid, weighing sixteen ounces, incarcerated in the pelvis. As the tumor could not be pushed up, laparotomy was performed, the uterus withdrawn from the abdomen, the tumor removed, and the child delivered by forceps applied in the dorsal posture. Mother and child recovered.

In the treatment of ovarian tumor obstructing labor, Spencer would push the tumor out of the pelvis if possible. He discards version, forceps, craniotomy, and simple incision or tapping of the tumor, on account of the danger. Cæsarean section will very rarely be necessary if the tumor be withdrawn from the pelvis. Abdominal ovariectomy is the safer operation, and should be preferred to vaginal ovariectomy.

Spencer also reports a dermoid ovarian tumor which was incarcerated in the pelvis and obstructed labor. The tumor was pushed up out of the pelvis under chloroform, the child delivered by forceps, and ovariectomy performed seven months later.

Rupture of the Uterus During Unobstructed Labor.—In the *Transactions of the Obstetrical Society of London*, vol. xl., Part I., DAKIN reports the case of a woman in her eleventh labor, aged forty years, who had a normal pelvis and whose child was in the normal position. Former labors had been

normal. There was no history of acute disease, although the patient was not well nourished. The patient had slight sharp pains, followed by slight bleeding. The membranes ruptured and the os dilated completely. As the patient was pale and had a pulse of 100, she was delivered easily by forceps. The child was dead. Efforts were made to express the placenta, but were unsuccessful. The physician who introduced the hand found above the external os a rent on the right side and the placenta half-way through it. He extricated the placenta, and then severe collapse occurred, in which the patient died.

On autopsy, the abdomen was full of blood. The uterus was well contracted. The tear extended from a point a little above the internal os and three-quarters of an inch below the retraction ring to a point between the right tube and round ligament. The tear was at first almost horizontal, then oblique and then vertical. The placental site was torn through by the rupture.

A microscopical study of the muscle fibres showed them to be fatty and abnormally friable.

Two Cases of Cæsarean Section.—In the *Boston Medical and Surgical Journal*, June 2, 1898, WASHBURN reports two Cæsarean operations done in the homes of the patients. Both were successful. The houses were country tenements, and very limited conveniences for operation were at hand.

In the first case the true conjugate was a little over three inches. The patient had been in labor twenty-four hours, was thirty-eight years old, and this was her first pregnancy. The usual cœlio-hysterectomy was performed, the placenta and membranes were torn off rapidly, the uterus washed out with hot lysol solution, the washing being done through the cervix and vagina, and a strip of iodoform gauze was packed through the uterus and down into the vagina. The muscular portion of the uterus was sewed with a No. 3 catgut, the stitches about an inch apart. The serous layer was closed with continuous suture of small catgut. The abdomen was closed as usual and the usual dressing applied. The child weighed eleven pounds. Some portions of membrane were left in the uterus, and an intra-uterine douche was given, which brought them away. The patient was up and about in five weeks, and three months later was perfectly well. She got out of bed several times during the first ten days when the nurse was absent from the room.

In the second case high forceps had been tried unsuccessfully. The same method of procedure was followed with a very good result.

Exploratory Laparotomy in Vomiting of Pregnancy.—REYNOLDS (*Boston Medical and Surgical Journal*, June 2, 1898) reports a case of pernicious vomiting in which a pelvic enlargement complicated the condition. Without an anæsthetic the cervix was dilated sufficiently to permit the passage of a small curette. As a clear diagnosis could not be made in this manner, the patient was quickly etherized and the abdomen opened, when it was seen that the mass was a fibroid, the uterus pregnant at about three months. The abdomen was immediately closed, the cervix was then forcibly dilated, and a small ovum removed from the fundus above the fibroid. The patient instantly improved and subsequently made a good recovery.

The Bacteriology of the Vagina.—In the *Archiv f. Gynäkologie*, Band lv., Heft 3, 1898, KOTTMANN describes investigations to determine the presence or absence of bacteria in the vagina during pregnancy, and also the sort of germs which are there present.

He found that in women who had not been examined, bacilli of various sorts are present in the vaginal secretion. The staphylococci found in these cases are identical with those found in other conditions. The streptococci resemble exactly those seen in septic cases, differing only in virulence. They become deadly readily after labor. Kottmann found it impossible to separate vaginal secretion into normal and pathological. He believed that no prognosis regarding the patient's recovery could be formed from this factor alone. Germs found in the lower portion of the vagina are more virulent than those isolated from the upper part.

Repeated Ectopic Pregnancy and Operation in the Same Patient.—In the *Zeitschrift f. Geburtshülfe und Gynäkologie*, 1898, Band xxxviii., Heft 2, FALK reports the case of a woman, aged twenty-nine years, who seven years before had a normal labor followed by a normal recovery. After menstruation had ceased for two months, she had bleeding for six days, but passed no membrane. She complained of pain in the sacral region and weakness. On examination an elastic tumor was found behind the uterus, and a few days afterward the patient had a sudden attack of syncope. On abdominal section, pregnancy was found in the right tube, which was removed. The patient made a good recovery. Three years later she returned to the clinic in a very anæmic condition. There were dulness over the abdomen and a tumor behind the uterus, which was elastic.

The history was given that the patient had ceased menstruation for several months, and that while milking she was suddenly taken with collapse.

She took strong purgatives, which further reduced her strength. On opening the abdomen, the left tube was found pregnant and ruptured. Considerable blood had escaped behind the uterus. The tube and ovum were removed, the pelvis emptied and drained, and the patient made a good recovery.

GYNECOLOGY.

UNDER THE CHARGE OF

HENRY C. COE, M.D., M.R.C.S.,
OF NEW YORK.

Post-operative Pyschoses.—In a discussion on this subject before the Société de Chirurgie (*La Presse Médicale*, 1898, No. 28), REYNIER denies that psychical disturbances could result from surgical operations in patients without any previous tendency to such manifestations. A careful review of the family history of such individuals will show that there is either a marked hereditary taint, or that they have already presented evidences of some mental or moral aberration.

SEGOND affirmed that he was unable to offer a satisfactory explanation of the psychoses following gynecological operations. He was inclined to believe that suggestion was an important factor in many instances. Among 642 cases of artificial climacteric he was able to find, after a conscientious search, only four patients with post-operative mental affections—one of kleptomania, two of melancholia, and one of mania. The latter persisted for only two weeks, and the two cases of melancholia made a rapid recovery. The patient with kleptomania "was a thief before operation, and remained one afterward."

The speaker summarized his views as follows: There is no recorded case of a psychosis directly due to a surgical operation. In the great majority of the cases in which mental disturbances have been attributed to surgical interference the patients were either mentally affected beforehand, or possessed an hereditary taint. In the absence of a previous history, women who become insane after operations should be regarded as the victims of suggestions, furnished by either the physician or friends of the patient.

[These opinions are so much at variance with those usually expressed by writers on this subject that they deserve careful consideration, especially in view of the weighty authority of Segond. So many loose statements have been made with regard to the frequency of psychoses following gynecological operations, that it is evident that this question needs thorough revision. The theory that suggestion has much to do with the psychical disturbances observed in women after removal of the ovaries has a strong air of probability, considering the views prevalent among the laity, which have received general support from the profession, often on a purely sentimental basis.—H. C. C.]

Plastic Operation for Incontinence of Urine.—LEBEDEFF (*Wratch ; La Gynécologie*, 1897, No. 6) reports the case of a patient who was unable to retain her urine after an operation for urethro-vesico-vaginal fistula. In order to replace the sphincter action which was wanting he devised the following method of making pressure upon the posterior wall of the urethra. A surface an inch long and half an inch wide was denuded on either side of the urethra, in the folds between it and the labia minora. The posterior wall of the urethra was then pushed upward so that the surfaces could be apposed, and their inner edges were united by a continuous catgut suture. Silk sutures were used to complete the approximation. On filling the bladder with water and exercising pressure upon it, its retentive power was found to be perfect.

Surgical Treatment of Retroversion.—DOLÉRIS (*Ibid.*) concludes an elaborate paper on this subject by emphasizing the unsatisfactory results often obtained in the treatment of retroversion by plastic operations on the cervix uteri and vagina. Moreover, even when these operations have been supplemented by shortening of the round ligaments, hysteropexy, etc., errors in technique or subsequent accidents have allowed the uterus to return to its abnormal position.

The writer denies that retroversion in itself is not a disease. It is the result of a complex disturbance of the pelvic equilibrium, of which it is, however, usually only an epiphenomenon. None the less, treatment should be

directed toward the deviation. When the symptoms persist after the introduction of a pessary or after operative interference, it is usually because there is a return of the displacement. He is opposed to the use of a pessary after performing plastic operations on the cervix and vagina, since the patient might be cured by shortening the round ligaments or hysteropexy. It is assumed that uncomplicated retroversions are considered; in the presence of salpingo-oöphoritis, the latter is necessarily a side issue.

Kustner's Incision in Cœliotomy.—FRANTZEN (*Gaz. de Botkine; La Gynécologie*, 1897, No. 6) describes the following modification of Küstner's incision in ventro-fixation: A transverse cut is made through the skin, its edges are held apart with retractors, and the peritoneal cavity is then opened by a longitudinal incision. Two sutures are passed through the fundus uteri and include the peritoneum, aponeurosis, and lower skin flap. Deep sutures are inserted, and finally the edges of the external wound are approximated, and the sutures including the uterus are tied over a roll of gauze. The resulting cicatrix is said to quite firm.

General Gonococcus Infection.—RENDU and HALLÉ (*Sem. Gyn.; La Gynécologie*, April 15, 1898) report the case of a woman, aged thirty years, who entered the hospital after an illness of ten days. Her abdomen was relaxed and not tender, there was no vaginal discharge, and the bimanual examination was negative. There was no elevation of temperature; in fact, the only symptom was extreme lassitude.

The night after her entrance she began to menstruate, and continued for five days. On the sixth day she had a chill, and subsequently developed obscure septic symptoms, so that a diagnosis of possible septic endometritis was made. A drop of mucus removed from the cervix contained gonococci, whereupon injections of permanganate of potassium were used.

Three weeks after admission peri-arthritis developed in the left elbow, and a specimen of serum obtained with a hypodermatic syringe was found to contain Neisser's cocci. An incision gave temporary relief; the fever continued, but no other septic foci could be located. Two weeks later septic endo- and pericarditis developed, and the patient died, six weeks after entrance. At the autopsy, pleurisy, endo- and pericarditis were found, the fluid containing numerous gonococci. The pelvic organs were entirely normal.

Curettement in Uterus Bipartitus.—BLONDEL (*La Gynécologie*, April 15, 1898) reports the following interesting case in which it was supposed that the uterus had been perforated by a curette. The patient was curetted on account of menorrhagia, a previous examination having revealed nothing unusual except a slight fulness in the right lateral fornix. The os was patulous, and on introducing a sound the uterine cavity appeared to be slightly enlarged. While gently using the curette, as the instrument was turned toward the right cornu, the uterine wall was felt to yield, and it suddenly penetrated to the depth of an inch. The operation was at once suspended, the cavity of the uterus was irrigated with hot saline solution, and the patient was returned to her bed. No reaction followed, and she was discharged eight days later.

Five months after the curettement was repeated on account of profuse

bleeding, and the curette again penetrated into a cavity at the right cornu. The cervical canal was subsequently dilated with tents, so that the finger could be introduced, when the presence of a diverticulum could be made out, separated from the uterine cavity by a distinct septum. At the lower end of the latter was an opening through which a sound could be passed to the depth of an inch, when its tip encountered a firm wall. A curette was introduced into this cavity, and a specimen of mucous membrane was obtained similar to the hypertrophied endometrium. By the use of an intra-uterine speculum, the orifice leading into the diverticulum could be demonstrated, thus establishing the diagnosis.

The writer adds that uterus bipartitus is such a rare condition that one would not be apt to think of it in connection with curettement, but would rather infer that the curette had perforated the uterine wall instead of entering a diverticulum. It would not be possible to make an exact diagnosis except in the manner adopted in the case reported. It is evident that such an accessory pouch would form an excellent nidus for specific germs, which could be reached and disinfected only with great difficulty.

Treatment of Vesico-vaginal Fistula.—ROUZMINE (*Boln. Gaz. Botkina; La Gynécologie*, April 15, 1898) analyzes forty-four cases of fistula observed in the hospital at Saratoff among 1004 gynecological cases (4.36 per cent.). This large proportion corresponds with Neugebauer's observations that fistula is relatively most frequent among Russian women, on account of the fact that midwives are rarely employed by the peasants, and hence prolonged labors are common.

As regards the results of operative interference, 47.74 per cent. were cured by a single operation; 6.81 per cent. by two; 18.18 per cent. were relieved by diminishing the size of the fistula; episiotomy was successful in one instance; eight patients were not relieved. The denuded surface was always quite extensive, and was made so that the edges could be approximated with the least possible tension. Silk sutures were generally used (rarely silver wire), which were removed on the sixth or eighth day. A catheter was left in the bladder for nine or ten days, after which time the patient was allowed to leave her bed. Anæsthesia was rarely used.

Vaginal Hysterectomy with Elastic Ligatures.—STRAUCH (*Med. Obz.; La Gynécologie*, April 15, 1898) describes the following modifications of the usual technique: After separating the bladder and opening the anterior and posterior cul-de-sac, the bladder is protected with a speculum and the uterus is drawn downward (the organ being bisected or morcellated, if necessary), so that an elastic ligature can be passed over each broad ligament. The ligature is tied as tightly as possible, and in its loop is secured a piece of stout silk. It is necessary to leave a large stump in order to prevent slipping. The usual gauze tampon is inserted. The patient is allowed to sit up on the ninth or tenth day, and the gauze and elastic ligatures usually come away at the end of two weeks with the distal ends of the stumps.

The writer has operated by this method in twenty-three cases of benign neoplasms and diseased adnexa without meeting with any complications. It is, of course, not applicable to cases of malignant disease. He no longer re-

moves the diseased tubes and ovaries by the abdominal route, because his results have been so unsatisfactory.

Thyroid Extract in Gynecological Affections.—SACHS (*Kromka Cekarska.*; *La Gynécologie*, April 15, 1898) used tablets containing four and one-half grains of the extract, one being administered daily at first, the dose being increased to four within a few days. No ill effects were noted. Dysmenorrhœa and hemorrhage were the indications followed, but the results were unsatisfactory. In no instance was any improvement noted in a number of cases.

PÆDIATRICS.

UNDER THE CHARGE OF

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ASSISTED BY

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A New Diagnostic Sign of Measles.—KOPLIK (*Medical Record*, April 9, 1898) calls attention anew to a pre-eruptive sign of measles which he first described in 1896 (*Archives of Pediatrics*, December, 1896). Further experience has convinced him of the pathognomonic value of this sign at a time when positive diagnosis of measles is impossible—that is, from seventy-two to twenty-four hours before the appearance of the exanthem of the skin. This phenomenon consists in an eruption of minute bluish-white specks, surrounded by a reddish area upon the mucous membrane of the cheek and lips. These minute specks are but lightly attached to the mucous membrane, and may be rubbed off if the mouth has been washed. In some cases only a few red spots with their central bluish specks are observed; but in other cases the whole lining membrane of cheeks and lips may be covered. As distinguished from other deposits upon the oral mucosa these bluish specks never become white and opaque like sprue spots, nor do they coalesce and become plaque-like in form, but always retain their punctate character.

As the exanthem on the skin appears and spreads, the eruption on the mucous membrane of the cheeks and lips becomes diffuse, and the character of a discrete eruption or spotting disappears, leaving an intense general redness simply dusted over with myriads of the bluish-white specks. When the skin eruption is at its height the buccal eruption begins to fade, and gradually disappears, even while the exanthem is still out. In the later stages of the fading skin eruption the phenomenon is no longer seen.

The great value of this sign of measles lies in the fact that its early appearance in the pre-eruptive stage enables the physician to isolate cases much earlier than has previously been possible, a proceeding that must be of inestimable value in hospitals and institutions where measles epidemics are justly dreaded. In differential diagnosis also this sign is of value in distinguishing

measles from other eruptive diseases and skin diseases resembling it, among which are rōtheln, scarlet fever, beginning influenza, forms of erythema multiforme, and some drug eruptions.

This sign can be seen only in very strong daylight falling from a window directly on the mucous membrane. It is necessary to evert the lips and cheeks either with a spatula or the finger.

[We can confirm the existence of this sign in the pre-eruptive stage of many cases of measles, and have come to attach great value to it as an aid to early diagnosis. If detected early it furnishes a most reliable means of distinguishing measles when the early eruption assumes the maculo-papular form so suggestive of variola.]

A Fatal Case of Hemorrhage Under the Scalp in a Newborn Infant.

—C.W. TOWNSEND (*Boston Medical and Surgical Journal*, March 3, 1898, p. 207) reported this curious accident in an infant coming under his care at the Boston Lying-in Hospital. After a short first stage of four and one-half hours, and a second stage of two hours and fifteen minutes, the child was delivered with forceps, because of lack of progress and what was thought to be a large caput succedaneum. After the delivery the supposed caput instead of decreasing became larger, and was found to be soft and fluctuating, and was due evidently to an effusion of blood. On the third day it was still larger, extending over the whole cranium. The infant was pale, and its rectal temperature was only 96.8°. On the seventh day the tumor was still increasing, extending over the frontal bones and down the sides of the skull. Death ensued on the tenth day.

At autopsy the body was greatly blanched. A firm blood-clot extended under the scalp and above the periosteum (thus differing from a cephalhæmatoma) over the entire cranium, three-quarters of an inch thick in places. This clot reached from the foramen magnum behind to the middle of the frontal bones anteriorly, and down to the ears on both sides. The child had bled to death under its scalp. It was impossible to find the source of the hemorrhage, but there seemed to be several points of origin. No hemorrhages were found elsewhere.

The Home Modification of Milk.—WESTCOTT (*Archives of Pediatrics*, January, February, 1898) proposes a simple method of calculating the proportions of cream and whole milk required to make any percentage-formula. The essential feature of the method lies in assuming a fixed average percentage of the proteids of mixed cream and milk. In combinations of 12 per cent. cream and milk this factor is taken as 3.90, and for 16 per cent. cream and milk 3.80 is used. Representing the desired percentages of fat and proteids by the symbols F and P, and the total quantity (ounces) of mixture by Q, the quantity of mixed cream and milk is obtained by the proportion

$$3.90 : P :: Q : x.$$

After working out the value of x , the quantity of cream (C) is found by substituting in the formula

$$C = \frac{Q \cdot F - 4x}{8 \text{ or } 12},$$

the denominator of this fraction being 8 or 12 as 12 per cent. or 16 per cent. cream respectively is used. The quantity of milk is at once found by subtracting the value of C thus found from the value of x previously calculated.

The calculation of the amount of sugar of milk to be added is similarly made for any percentage of sugar desired (S) by the formula :

$$\text{Sugar in ounces} = \frac{Q.S - 4.4x}{100}.$$

After the quantities of milk, cream, and sugar are determined, dilution is made up to the total quantity required (Q) by the addition of water, barley-water, or any other chosen diluent.

BANER (*New York Medical Journal*, March 12, 1898) suggests similar methods of calculation, but by neglecting the differences in the proteid values of milk and cream and taking 4 as this common proteid factor, he calculates the quantity of cream required (16 per cent.) by the formula :

$$C = \frac{Q}{12} \times (F - P),$$

[the symbols being the same as in the previous formulæ].

The quantity of milk, then, is expressed by the formula :

$$M = \frac{Q \times P}{4} - C.$$

The quantity of sugar also, by assuming 4 as the percentage of sugar in the milk and cream, is obtained by the formula :

$$\text{Sugar} = \frac{(S - P) \times Q}{100}.$$

[By either of these methods home modification of milk can be accomplished with a considerable degree of accuracy. Westcott's method, like those proposed by Rotch and by Holt, is based upon analyses which have been adopted for laboratory modifications, and its results are very close to those secured by the laboratory. His proteid factor, 3.90, is the average between the 4 per cent. of whole milk and the 3.8 per cent. of 12 per cent. cream, while 3.80 represents the mean between 4 per cent. and the 3.6 per cent. of 16 per cent. cream. Baner's factor, 4, seems rather too high for the ordinary run of milk, and the addition of cream would tend still further to lower it. Whether 4.4 or 4 be taken for the sugar factor is not of great importance, and the integer makes the calculation more expeditious.]

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DANGER OF ERROR IN DIAGNOSIS BETWEEN CHRONIC
SYPHILITIC FEVER AND TUBERCULOSIS.¹

BY E. G. JANEWAY, M.D.,
OF NEW YORK.

THE subject which has been chosen for brief presentation before a medical body composed as this is must be defended by its recital as necessary, or else it would be presumptuous to take your time in the consideration of well-known diseases. A certain number of cases demonstrably of specific nature have come under my observation, condemned as being tubercular, not, as a rule, by physicians of little experience, but by those of well-established reputation, some being teachers and writers of medicine. Let us first pass in review the salient points of such cases, and you will bear in mind that from the nature of the subject more cannot be done.

The first of this group had been sent to a noted health resort for phthisical subjects; but instead of improving had steadily lost ground, so that after three months' trial he came to me reporting a loss of forty pounds in weight, a slight continued fever, a sense of weakness, and a pain in his right side. On examination this pain was found to be dependent upon a perihepatitis which was productive of distinct friction sound, with both inspiration and expiration, and also of palpable friction fremitus. An inquiry disclosed the fact that he had been a victim of syphilis ten years before. No proof could be found of any pulmonary lesion. Under antisypilitic treatment in two months he had regained his weight, had lost the fever and malaise, and since that

¹ Read before the Society of American Physicians, May, 1898.

time has remained well. No doubt can be entertained that in this case the liver was the site of the specific processes which had been the cause of his hectic and of his ill health. Whether it would have been possible to detect the liver implication at a very early period I cannot determine; but he had seen two of the leading diagnosticians of this country in different cities, neither of whom had made out the nature of his sickness, and by one of them he had been sent to the health resort for tuberculosis of the right lung.

A second case is that of an adult male who came to be examined because of fever, sweating at night, loss of weight, and pain in the right side. He had been ordered by a professor of medicine, who was also a noted examiner of diseases of the chest, to give up his business and remove to a resort for consumptives in consequence of tubercular disease of the right lung. A careful examination failed to reveal any distinct signs of focal pulmonary disease, but on more critical investigation two of the ribs on the right side were found to be sensitive to pressure, and a small sinus was disclosed in the neighborhood of the middle third of the right clavicle. He admitted syphilitic infection in early manhood. Antisyphilitic treatment removed his fever, and within a month he had regained his weight.

The third case relates to a patient who came to me with the history that he had been sent to a prominent health-resort for consumptives because of the nexus of symptoms which have been detailed. After two months' stay there he had been sent home, because of the continuance of his fever and of his steady decline, which, in the opinion of the physician there, thoroughly informed and capable, indicated miliary tuberculosis, for which there was no hopeful outlook. This physician has been frank enough to state that he could not satisfactorily locate the disease. My own examination was negative in so far as making out the location of a process which was productive of the disturbance of his health. This led to a cross-examination of the patient in regard to his antecedents. He admitted that he had had syphilis in the past. Under antisyphilitic measures he made a rapid improvement. Then he removed to another healthy locality, where a little over a year later he suffered from a synovitis of the knee-joint. The surgeons of the place considered this to be tubercular, and advised incision. He returned to me for advice. In addition to the effusion in the joint there was some thickening of the lower end of the femur. Again, under antisyphilitic treatment, within three weeks he had made such improvement as to be practically well, and has continued so since—a period of three years.

A fourth patient was referred to me for probable tubercular implication of the apices of the lungs, who had a rather marked cough in addition to the chain of symptoms outlined. Because no improvement had followed a residence in a mountain resort near his home, and

because of the steady decline in his health, and of the continuance of his fever for five months, notwithstanding the use of quinine and creosote, he had been ordered to a remote mountain region. He came to me to know if I could suggest any plan of treatment by which he could avoid the necessary sacrifice of his business interests should he act upon the advice given. The physical examination of the lungs was negative; such sputum as he could furnish did not contain bacilli of tubercle, neither did the examination of his body disclose any localization of morbid process which could satisfactorily account for the disease. A cross-examination elicited the history of a by-gone syphilitic infection. Within three days from the commencement of antisymphilitic treatment his fever subsided; and he wrote me from his home, after the lapse of three months, that he had regained flesh, strength, and health. His letter closed with the inquiry why his physicians had not resorted earlier to the use of a remedy which had proved so efficacious.

The fifth case was that of a young child who had continued fever, wasting, and a somewhat larger liver than his age warranted. The child had been treated with the idea of malarial infection in vain. The examination of the lungs did not disclose any sufficient evidence of tubercular trouble to warrant a diagnosis of that condition. A careful questioning was made as regards the possibility of tubercular infection through milk or contact, but without proof. The child was somewhat emaciated, and the examination of the abdomen failed to prove any enlargement of the glands. This led to a careful discussion of the case with the child's physician as regards the diagnosis, which, to my mind, lay between syphilis and tuberculosis. The enlarged liver inclined me to the diagnosis of syphilis, but I was assured that there was no possibility that either parent had had that disease, from personal knowledge, and I was dissuaded from making a cross-examination. The result was that a diagnosis of probable tuberculosis was made. Later I was informed that, the child dying, an autopsy had revealed syphilitic infection of the liver, and the parental parent had admitted a by-gone syphilis.

The sixth case is that of a male patient over thirty, now under treatment. He had syphilis ten years ago, and consulted me because of an urticaria which had come from eating stuffed peppers. He had a very pale look, which was dependent on deficiency of hæmoglobin. The examination of the body revealed some enlargement of the liver and spleen. On inquiry, it was learned that he had lost thirty-five pounds in the past two years, had sweats at night from time to time. The result of giving him a thermometer was to disclose the fact that he had a constant temperature which varied from 100° to $101\frac{1}{2}^{\circ}$ for the most part, but on one occasion was 102° and on another 104° F. during eight days of observation. There was more or less sweating at night.

A careful examination of the lungs was made, with negative result. The blood showed neither plasmodia nor hyperleucocytosis. He was placed upon antisyphilitic treatment and five grains of quinine twice daily. Within a week he was much better. Less sweating and only very slight fever were noted. At the end of three weeks he reported that for a week he had not had fever. His weight had increased two pounds, and the examination shows a distinct reduction in the size of the liver and of the spleen. Without administration of iron there had been, moreover, a distinct gain in his appearance, as indicative of improved hæmoglobin hold as the test by hæmoglobinometer.

To these could be added one other, were it not for the fact that an eruption appeared after weeks of fever, for which residence in a hospital, change of climate, and varied medication had been tried in vain. Specific measures produced a cure.

Cases likewise come under observation in which, with a history of past syphilis and a very limited area of lung implication, it can be hoped that the disease may be alone of specific nature. The most instructive case of this kind which I have followed through its course related to a man who came to me after a slight hæmoptysis. The only manifestation of pulmonary trouble was situated in the upper part of the lower lobe of the left lung. Here for a long time slight dullness, a little broncho-vesicular breathing, and a few subcrepitant râles were all that could be made out. No bacilli were found in the scanty expectoration until one year from the attack and after he had been a resident of two health resorts. The disease spread in his case from the small beginning until the whole lower lobe was involved, a cavity formed, and the upper lobe of the same side affected. The question in such a case could be raised as to the nature of the process at its origin, and whether an original specific focus had become infected by tuberculosis. It is, however, manifest that the physical signs enumerated would, in one without a history of syphilis, have been considered sufficient to establish a diagnosis of tuberculosis, considering the existence of hæmoptysis. Moreover, in this case, no impression was made by the employment of antisyphilitic measures.

The consideration of the facts here narrated have convinced me that many physicians are not aware that fever may attend the late manifestations of syphilis, more particularly of visceral syphilis. The neurologist is sufficiently alive to the importance of always considering the possibility of syphilis being an etiological factor in the obscure diseases of the nervous system, and he very generally gives the patient the benefit of a doubt, when uncertain, and attempts a diagnosis by the use of antisyphilitic measures. Moreover, the class of cases to which I have drawn your attention do not go to a syphilologist, but to the general or consulting physician, and this paper has been presented with

the view of directing attention to the necessity of considering syphilis as a possible explaining cause of those obscure phenomena which are usually only considered to import tuberculosis, malaria, or sepsis. Moreover, I do not find that in the presentation of the subject the syphilologist directs attention specific enough to the possibility here presented. Ignorance of the fact that syphilis, in what is termed its tertiary period, may occasion a fever of long duration, malaise, emaciation, perhaps perspiration, also, without of necessity presenting such definite local manifestations, either external or internal, as can be made out on such casual examination as often occurs when a patient seeks advice at the office of a consultant on one or a few occasions, is largely the explanation of the mistakes.

In two of the cases related it was not possible to state the situation of the disease after very careful examination. We must confess that not a few physicians are inclined, with the above assemblage of symptoms, to determine that tuberculosis must exist; and, having reached that decision, enough of that normal variation of physical signs will be made out to lead to the belief that the explanation has been found in certain pulmonary changes. Moreover, it has seemed to me that physicians having a strong belief that tuberculosis existed may have had an auditory illusion or hallucination. It is far wiser and better, to my way of thinking, to hold the mind in such a condition of attention in doubtful cases as shall admit of expression of doubt, than to attempt a positive diagnosis on insufficient data.

THE DIFFUSE INFILTRATING FORM OF SECONDARY MELANOSARCOMA OF THE LIVER AND ITS ASSOCIATION WITH ASCITES.¹

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SECONDARY sarcoma of the liver may occur in the form of circumscribed masses and nodules, as a diffuse infiltration of the whole liver, or in the form of a mixture of both varieties. The reports in the litera-

¹ Read by title at the thirteenth annual meeting of the Association of American Physicians at Washington, May, 1898.

ture show that so far secondary melanosarcoma is the only histological variety of sarcoma that possesses the remarkable faculty of growing diffusely throughout the liver, so that in time the organ becomes almost entirely replaced by tumor tissue. The text-books of pathological anatomy (Ziegler, Birch-Hirschfeld, Kaufman, and others) contain good descriptions of the striking, marmorated appearances of the liver the seat of diffuse, infiltrating secondary melanosarcoma, and pathologists are agreed that secondary sarcoma of the liver, as well as elsewhere, is of metastatic and hæmatogenous origin. In the diffusely infiltrating variety single cells immigrate more or less continuously into the intralobular capillaries of the liver, where they multiply within the vessels and cause a gradual disappearance of the columns of liver-cells by a process of pressure atrophy. These migrating cells may pass through the capillaries of the lungs and probably, also, of the intestines, because in the vast majority of cases it concerns primary melanosarcoma of the eye or its immediate vicinity. As a general rule, secondary tumors develop elsewhere in the body also, especially in the lungs, but the liver seems to furnish the best conditions for the lodgement and further growth of the tumor cells.

As already stated, the majority of the secondary melanosarcomas of the liver are due to metastasis of a primary tumor in or near the eye. A good account of the literature concerning the nature and location of these ocular and orbital melanosarcomas is given by L. P. Hamburger (*Bulletin of the Johns Hopkins Hospital*, ix., 1898), in a recent report of two cases of secondary melanosarcoma of the liver following sarcoma of the eye; in one case post-mortem showed a nodular metastasis in the liver which weighed 8.3 k. In connection with this report Abel makes some valuable remarks concerning the chemical composition of the pigment produced by these tumors.

The following cases are interesting as typical examples of the diffuse, infiltrating form of secondary melanosarcoma of the liver in their clinical as well as anatomical features; they have an additional and greater value, however, because they illustrate the development of ascites from portal obstruction due to intracapillary proliferation of tumor-tissue in the liver. As far as can be learned from the literature, the development of ascites on this basis has not been noted in connection with secondary sarcoma of the liver. In Musser's case (*Transactions of the Philadelphia Pathological Society*, New Series, vol. i., No. 2) there developed ascites two weeks before death, but this is apparently attributed to a concomitant "dense fibrous hyperplasia" in the liver, which weighed 8.5 k. (17½ pounds), and was the seat of a "round-celled sarcoma with melanosis;" the patient, a man, aged forty-two years, died from the hepatic symptoms two and a half years after the removal of the left eye for melanosarcoma.

CASE I.¹ *Diffuse infiltrating melanosarcoma of the liver, secondary to melanosarcoma of the choroid of the right eye; ascites due to occlusion of the capillaries of the liver and consecutive thrombosis of the intrahepatic branches of the portal vein.*—Man, aged fifty years, manufacturer, of dissolute habits, came under the care of Professor E. L. Holmes, at the Presbyterian Hospital, September 17, 1895, on account of loss of vision in the right eye which dated back about three years. Professor Holmes diagnosed the condition of the right eye, which was protruding and nodular, to be due to a melanosarcoma of the choroid. Physical examination was otherwise practically negative. On November 15th some ascites had developed, and on the 25th of this month the ascites had become pronounced; there was jaundice and the urine contained bile-pigments. The patient passed into the care of Dr. J. A. Robison, and thanks are due both Professor Holmes and Dr. Robison for their permission to make this extract from the clinical history of the case.

The patient died December 7, 1895, apparently from exhaustion. The post-mortem examination was made one hour after death.

The anatomical diagnosis reads: Melanosarcoma of the right eye and the orbit; atrophy of the right optic nerve; metastatic tumors in the lungs, pleuræ, and left kidney; diffusely infiltrating metastatic melanosarcoma of the liver; chronic congestion of the spleen; thrombosis of the intrahepatic branches of the portal vein; ascites; general bile pigmentation; chronic nephritis; chronic (left) orchitis; general arteriosclerosis.

The body is much emaciated; the skin and visible mucous membranes yellow; the right eye protruding, the eyeball nodular; the orbit is filled with a hard mass; the cornea turbid.

The abdominal cavity contains a large quantity of yellowish fluid; the peritoneal layers are smooth. The pleural and pericardial cavities are empty.

The heart weighs 450 grammes; endocardium normal.

The lungs are œdematous and contain a few small, solid nodules that are grayish and in places almost black on the cut surface. Similar smaller masses are found here and there in the pleuræ. The larynx, trachea, and peribronchial glands are normal.

The spleen is firm, very dark-red in color, contains much blood, and weighs 450 grammes.

The kidneys weigh 350 grammes; the surface is irregular, the cortex thin, the consistence firm. In the left kidney is a small, subcapsular tumor nodule. The left testicle is firm, fibrous.

The liver is very much increased in size, the left lobe being almost as large as the right; it weighs 4100 grammes. The external surface is rather finely nodular, mottled bluish and gray in color; many small, pinhead-sized and a little larger gray tumor masses are seen on the surface. In consistence the liver is very dense and firm, like sole-leather or hard rubber. The cut surface is also irregularly nodular or granular, the predominating or ground color being bluish-black, with small gray districts here and there, so that the general appearance of the surface is best described as granite-like or variegated, like marble.

¹ This case is described in the Transactions of the Chicago Pathological Society, 1897, vol. ii. p. 133.

The large vessels in Glisson's capsule and the branches of the portal vein are filled with rather softly-coagulated blood.

The gastro-intestinal tract is normal, but the mucous membrane is slaty in color. The pancreas is normal.

The aorta and the splenic artery show a rough and irregular intima.

The skull and the brain are normal, the vessels at the base being sclerotic.

The interior of the right eye is partly filled with a firm tumor that seems to spring from the choroid, is quite black on the cut surface, and largely replaces the vitreous humor; at the entrance of the optic nerve the tumor extends for a short distance backward in the substance of the nerve, and at the corneo-scleral junction of the internal aspect of the globe the tumor tissue perforates all the coats of the eye and spreads out into a walnut-sized retrobulbar tumor-mass which is grayish white in color, with only here and there blackish or brownish dots and areas. The right optic nerve is smaller than its fellow, and gray in color.

Blood-serum tubes inoculated from the heart's blood and the ascitic fluid remained sterile.

The microscopic examination of the tumor of the eye and the pulmonary and renal nodules show the structure of a typical melanosarcoma; the pigmentation is most uniform in the eye; in the other places the majority of the cells are not pigmented, but chromatophores occur in all.

The liver shows but remarkably little true liver structure; it consists almost entirely of tumor tissue which is, speaking broadly, very much pigmented, typical, slender, branching cells filled with brownish pigment predominating; often the amount of intracellular pigment is so marked that the nucleus is hard to see. Groups of, and single, non-pigmented cells also occur. Wherever the hepatic structure persists the capillaries are filled with tumor cells often to an excessive degree, producing a marked compression of the adjacent columns of liver-cells, whose gradual disappearance from atrophy can be traced from the early to the final stages, when but narrow, almost imperceptible bands of protoplasm remain, to be succeeded by coalescence of the intracapillary tumor emboli. As a result of this form of growth the tumor has an indistinct alveolated appearance. (The alveolar structure is not nearly so well marked as in the second case, presumably because the infiltration has been more uniform, the embolism and the capillary growth occurring at the same time and with the same degree of rapidity throughout the organ.) Careful scrutiny failed to show any histological appearances that would point to removal of the liver-cells by means of phagocytic action of the cells of the tumor. In the large vessels are often found single cells, as well as masses of tumor cells. Remnants of, as well as intact, biliary ducts are found, principally in a somewhat thickened Glisson's capsule which is the seat of a small degree of round-cell infiltration. Otherwise there has been no connective-tissue increase in the liver. In some of the larger vessels are hyaline thrombic masses, the exact nature of which is doubtful, because the pieces examined were hardened in Müller's fluid. In some places the tissue in what must be parts of Glisson's capsule presents an appearance as though it were oedematous.

CASE II. *Melanosarcoma of the eye, following trauma; extirpation and*

recurrence; secondary infiltrating sarcoma of the liver, with ascites.—Herman K., native of Germany, a resident of Cook County, Illinois, for eighteen years, by occupation a farmer; entered Dr. Herrick's ward in the Cook County Hospital, September 22, 1897.

Of his family history he knew little. There was no hereditary taint, so far as he knew. He himself had been temperate as regards the use of liquors, had escaped venereal infection, and had been singularly free from preceding serious illness.

He was more surprised, therefore, to find that during the past year, and particularly during the last six months, he had been losing in flesh and strength. His chief complaint was of this weakness and of a feeling of fulness and hardness in the epigastrium that had annoyed him for about four months. For one week there had been considerable distention of the abdomen. He complained of no pain whatever, had a good appetite, never vomited; bowels were regular.

Inquiry as to the circumstances leading to the loss of his right eye elicited the information that three years before he had been kicked over the right eye by a horse, the eye, or the parts in the immediate vicinity, becoming greatly swollen. This swelling soon subsided, and the eye gave no further trouble until two years after, when it became swollen, "red, like a beefsteak," and the sight failed. The eye was removed at the Illinois Charitable Eye and Ear Infirmary one year prior to his admission to the County Hospital.

Status præsens. There is marked emaciation, the skin is dry and scurfy, of a muddy look; there is no icterus. The movements are evidently painless, though he is plainly very weak. The breath is fetid, the teeth decaying.

The left eye is normal, the right eye lacks the globe. Beneath the drooping lid a small, hard nodule can be felt, and the muco-purulent discharge comes from a reddish mass of granulations, and is often blood-tinged.

The lungs are clear. Over the lower right chest the dulness, continuous with that of the liver, rises in front and behind one inch higher than normal. The heart's action is rapid and snappy; its apex impulse is in the fourth interspace close to the nipple, as though displaced by the enlarged liver. The arteries are tortuous and have slightly thickened walls.

The abdomen is distended, and the signs of free fluid can be made out. The liver is plainly palpable, in the mammillary line its border being a hand's-breadth below the costal arch. Dulness in front is to the fourth rib. The surface of the liver feels firm and coarsely granular; it is not tender. In the epigastrium there is a distinct bulging forward. The edge is somewhat irregular or scalloped and is very hard. No nodules are anywhere distinctly made out. The liver descends freely with inspiration. The firm hard mass of the liver, the patient tells us, has been noticed by him for about four months.

No change can be made out in the other abdominal organs. The stomach is not enlarged; its contents were not examined. The rectum and genitalia are negative. The umbilicus is prominent. The inguinal glands are, perhaps, slightly enlarged, as are the axillary. There is œdema of the ankles and legs and slight œdema of the abdominal wall.

Scattered over the surface of the chest and abdomen are several hard, painless, freely movable nodules apparently in the subcutaneous tissue.

The largest, the size of a large lima bean, is just inside the vertebral border of the left scapula. The color of some of the nodules, as seen through the skin, is slightly black. One of these nodules in the abdominal wall was excised for purposes of diagnosis. This showed small round- and spindle-celled structure, with considerable fibrillated stroma; in occasional areas the cells contained small granules of brownish-yellow pigment, which also occurred between the cells. Diagnosis: Melanosarcoma.

The urine contained neither sugar, albumin, nor casts. When fresh it was clear, of a reddish-yellow color, and acid. On standing for several hours it became of a darker hue, and still remained acid.

With strong sulphuric acid and with nitric acid the color changed to a dark brown. On the addition of a small amount of a strong solution of ferric chloride a grayish precipitate was produced, which dissolved in an excess of the reagent. With bromine water a yellowish precipitate that gradually darkened was formed. These tests were regarded as evidence of the presence of melanogen in the urine, a common finding in cases of melanotic growth. In every instance the test was controlled by similar tests with other urines.

The diagnosis was made, therefore, of melanotic sarcoma of the eye, with metastases in the liver and subcutaneous tissue, and with recurrence of the growth at the original site. This diagnosis was further confirmed when an examination of the records at the Eye and Ear Infirmary showed that the eye had been removed for melanotic sarcoma. Careful examination was made for evidences of involvement by metastases of the lung, pleura, and pericardium, but neither by symptom nor by physical sign of friction, dullness, or altered respiratory or circulatory tone, was there any revelation of the existence of the nodules in these organs. The dullness from the small amount of fluid in the right pleura was believed to be due to the enlarged liver.

The question naturally arose as to the condition of the liver and the cause of the ascites, whether we had to deal with a pure sarcomatosis of this organ or with sarcoma in a cirrhotic liver. Notwithstanding the fact that the statement was made by some authors—*e. g.*, Leube—that in sarcoma of the liver ascites does not occur, the fluid in the abdomen was regarded as probably due to the growth in the liver, and this, from the absence of distinct nodules in a liver of these enormous proportions, was looked upon as probably the diffuse infiltrating variety. The solution of the clinical problem was rendered much easier by the recollection of the specimen of diffuse infiltrating sarcoma of the liver associated with ascites, shown by one of us at the Chicago Pathological Society a short time before (Hektoen: *Transactions Chicago Pathological Society*, 1897, vol. ii. p. 138.). That the fluid in the abdominal cavity was a transudate seemed probable from the fact that on October 9th a pint of clear serous fluid was withdrawn by puncture, and its specific gravity was but 1007. In the fresh and stained specimens from this fluid no pigment-containing cells were found. Nor were any cells resembling sarcoma cells or large cells with the atypical mitoses described by Rieder, Dock, and Warthin found. The peritoneum was presumably free from tumors and the fluid due to portal obstruction. The patient died rather suddenly a few days later.

Anatomical Diagnosis: Absence of right eye; pigmented tumor in right orbit growing into optic nerve; pigmented and pigment-free

tumors in the skin, the muscles, the lymph nodes, the pleura, the lungs, and the myocardium; diffuse tumor infiltration of the liver; ascites; right hydrothorax; left adhesive pleuritis, with slaty induration of left apex; oedema of the legs; ecchymoses in the floor of the fourth ventricle; sclerosis of the coronary arteries and of the aorta; chronic nephritis.

Abstract of Post-mortem Protocol: The body is wasted. The right eye is absent, and the orbit is filled with a nodular mass which is blackish on the cut surface. In the skin of the anterior surface of the chest are three or four movable, split-pea sized, slightly pigmented nodules; in the muscles to the left of the dorsal part of the spine is an oval tumor, 2 by 4 cm., with areas of blue pigmentation.

There are small pigmented masses in the anterior mediastinum; considerable clear fluid in the right pleural cavity; the left is obliterated by adhesions. In the pulmonary and diaphragmatic pleura are innumerable pedunculated and sessile tumor masses of varying size; there are tumors in the lung substance and in the peribronchial glands.

In the epicardium are many tumor nodules, the largest being over the anterior wall of the right ventricle near the coronary sulcus; the nodules are grayish or whitish in color. Attached to a papillary muscle in the left ventricle is a minute, pedunculated black mass. The coronary arteries and the aorta are somewhat sclerotic. The heart weighs 300 grammes and the endocardium is smooth.

The abdominal cavity contains several pints of clear, yellowish fluid; the peritoneum is smooth and shining. There are no thrombi in the portal vein or its large branches. The mucous membrane of the intestines is normal, that of the stomach rather slaty in color. In the omentum and mesentery are many small nodules.

The liver weighs 5000 grammes; it is the seat of a uniform enlargement that seems to involve the right lobe more than the left; the surface is mottled-gray and bluish-gray or black, and is quite smooth for the most part; but over the left lobe and along the lower margin of the right it is rough and even nodular, due to grayish or bluish projections; the consistence is very firm. On the cut surface the left half of the liver has a more bluish color, the right half a more yellowish gray, the line of junction being in some parts very sharp and recognizable on the external surface, but mottled areas of variegated appearance like marble also occur, as well as distinct nodules of varying sizes. Any traces of normal liver substance are not to be seen. The gall-bladder contains a small amount of bile. The pancreas, the spleen, the genito-urinary organs, and the adrenals are free from tumors; the surface of the kidneys is finely granular, the consistence increased. In the floor of the fourth ventricle are small hemorrhages; the tumor in the orbit extends in the optic nerve to the commissure, filling the nerve with a bluish-black mass.

The Microscopical Examination: Pieces from all the tumor masses were examined after the usual technical preparations. The pigmented as well as pigment-free masses outside the liver may be dismissed with the general statement that in the main they are made up of rather closely-packed, small, spindle and round cells, that run in interlacing bands of varying thickness which, cut across, give the tissue an alveolar appearance; here and there occur characteristic chromatophorous cells in small groups or scattered about singly.

A number of pieces were studied from different parts of the liver, in order to obtain a clear notion of the relation of the tumor-cells to the structural elements of the organ. It may be said at once that almost the whole liver has become substituted with tumor whose further expansive growth has been limited and so directed by the original framework of the liver that the resulting mass, at the time of death weighing 5000 grammes, still preserves the outline of the liver. It concerns, therefore, a diffuse infiltrating sarcoma of the liver.

Here and there in the uniform infiltration occur, as seen with the naked eye, distinct nodules. In these rather vascular areas the structure is indistinctly alveolar, the spaces being closely packed with rather small, mostly pigment-free, sarcomatous cells. A few small multinucleated cells are seen. The pigmented cells are mostly long drawn out, branching, even star-shaped, and also round; the pigment is yellowish or deep brown, mostly granular, sometimes scaly, at times covering all parts of the cell densely; at other times it is gathered along the borders of the cytoplasm or at the ends of the processes. When the processes are cut off, free pigment heaps are simulated. The pigment cells seem to prefer the outskirts of the spaces and to lie in the more distinct fibrous bands. Their shape and the arrangement of pigment granules are best seen in unstained preparations.

In the flat infiltration the alveolar arrangement of the cells is very prominent. The spaces are of various size, round, oval, more rarely oblong; the walls of the spaces are sometimes very indistinct, sometimes made up of a distinct layer of fibrous tissue, with narrow, elongated nuclei; again, of endothelioid cells, and finally remnants of bands of liver cells may be met with at the limits of the alveoli. The cells in the alveoli are mostly pigment-free, oval, round, or polygonal, with rather small bodies and deeply-stained nuclei; a few chromatophorous cells are frequently observed, and in some districts they predominate. Now there are extensive areas corresponding to this general description without any further trace of liver structure, and but few bloodvessels; occasionally, bands of hyaline connective tissue may be seen, with vessels and, perhaps, two or three rows of low columnar cells without any arrangement to form any distinct lumen; distinct, but empty, bile-ducts also occur.

The early stages of this replacement process are clearly made out on studying parts where some distinct liver tissue still persists.

In the first place, it is noticeable that of the capillaries encountered, all, or almost all, contain tumor cells among the blood-corpuscles or free in the empty lumen. The majority of these cells are chromatophorous, and the long, branched, star-shaped form of this cell is seen most typically among the blood cells. The majority of the persistent capillaries and vessels are unduly congested. From this beginning there can readily be traced a progressive intracapillary growth of melanosarcoma which crowds out the blood, distends the capillaries to the utmost, and produces a pressure-atrophy of the liver cells. In the earlier stages the rows of liver cells are still distinct, but the cell bodies soon lose their outlines and become amalgamated into protoplasmic bands that stain deeply with eosin and are thickly set with nuclei; the bands become thinner, the nuclei smaller and more closely crowded together until the resulting alveoli of tumor cells come into contact with each other. From the histological appearances it seems that a purely

mechanical pressure-atrophy of the liver structure precedes its often complete replacement with tumor tissue.

While the early capillary tumor-cell emboli seem to be principally chromatophorous, the more advanced intracapillary proliferations may in some cases produce pigment-free cells in predominating numbers; hence this may account for some of the extensive non-pigmented areas which, as seen on the cut surface of the liver, are most sharply demarcated from the pigmented districts; as already remarked, the process is everywhere so far advanced that nothing can be said as to just in what part of the lobule the free cells become first arrested, nor can any exact details be made out with respect to the hepatic veins or smaller bile ducts.

In a number of pigment-free or but slightly pigmented cells are karyomitotic figures.

It is, finally, noticeable that any proliferation and induration of the fibrous tissue has not occurred to the slightest degree.

CASE III. *Melanosarcoma of the right eyelid; extirpation; secondary sarcoma of the liver, presumably infiltrating, of the pleura and of the peritoneum, with ascites; no autopsy.*—Joseph P., aged fifty-four years, German, laborer. Admitted to Dr. Herrick's ward in the Cook County Hospital. Family and personal history negative.

In May, 1897, a dark-colored, easily-bleeding nodule of two years' standing was removed from the right upper eyelid—together with one-half of the lid—by Dr. D. A. K. Steele. February 28, 1898, patient felt so weak that he gave up work, which was loading coke. He had lost in weight, was short of breath, and was distressed by the increasing size of the abdomen.

Examination March 22, 1898, in Cook County Hospital, showed emaciation and weakness. One-half of right upper eyelid was left and showed nothing abnormal. Both eyes were the seat of a conjunctivitis, with a muco-purulent discharge. No growth could be demonstrated in the eye. Vision was good. Several dark-colored nodules, intimately connected with the skin, were scattered over the body, the smallest about the size of a pinhead, the largest, situated in the scalp over the right parietal region, as large as a hickory-nut. The lungs and heart were negative. There were signs of fluid in the right pleural cavity; by aspiration clear, light-yellowish, serous fluid. Cells containing fat and brownish pigment found in the sediment. There was free fluid in the abdominal cavity; 6500 c.c. were withdrawn. It was clear, yellowish, specific gravity 1018. Cells of varying size, often with two or three nuclei, and many containing pigment, were found in this fluid.

After the withdrawal of the fluid the liver could be palpated, its edge extending nearly to the umbilicus. The enlargement was chiefly in the right lobe. The surface and edge were hard, not nodular. In the right half of the epigastrium the enlargement caused a visible bulging. The spleen was not palpable. No masses or nodules could be felt in the abdomen. The lower extremities were not œdematous.

The red blood-cells were of normal size, shape, and color. They numbered 4,500,000 per cubic mm.; white cells 9680, with slight polymorphonuclear increase. No abnormal pigment was seen in the blood in fresh or stained specimens. Hæmoglobin, 80 per cent. (Fleischl).

The urine was scanty—fifteen ounces for the twenty-four hours. It

was acid, specific gravity 1030. No albumin, no sugar, no casts. Tests for melanogen with sulphuric acid, bromine water, and ferric chloride, all positive, and controlled by tests with known normal urine.

The diagnosis seemed clear of a pigmented growth involving the liver, skin, pleura, and peritoneum, and presumably secondary to the primary growth removed in May, 1897, from the eyelid, which growth had existed for two years. To confirm the diagnosis and to determine more accurately the nature of the tumor, one of the nodules from the chest was removed and examined microscopically. This showed a fibrillated stroma with an alveolar arrangement, packed with small round and spindle cells. Reddish-brown pigment granules and masses were seen here and there, having a tendency to be arranged in the fibrillary tissue and parallel with the fibres, but being found also in and among the round and spindle cells. Diagnosticated as a melanotic sarcoma. It was further learned from Dr. Steele's clinic that the diagnosis of the tumor of the lid at the time of the operation had been melanotic sarcoma. Unfortunately the patient refused to stay in the hospital and left at the end of a few days.

REMARKS. In general, the structure of the tumors agrees closely with that laid down by Hugo Ribbert (*Ueber das Melanosarkom*, *Ziegler's Beiträge*, 1897, xxi.) as peculiar for the melanosarcoma, or melanoma, as he would prefer to call the tumor in question, of the eye. The essential structure of the various growths is identical. The presence of the characteristic pigment cells in the majority of the areas, although in greatly varying numbers and degree of pigmentation, demonstrates clearly enough that it concerns metastatic tumors secondary to melanosarcoma in these cases of the right eye. Of the secondary growths, especial attention is called to the diffuse infiltrations in the liver. The first two cases, and probably the third, are typical instances of the diffuse infiltrating variety of secondary sarcoma of the liver, which nearly always concerns melanosarcoma. The histological examination points to a remarkably extensive and uniformly diffuse capillary embolism of tumor cells. In one case these cells passed almost unhindered through the pulmonary capillary network, as only a few tumor nodules were present in the lungs. In the second case cells were arrested in the lungs, the pleura, the myocardium, the pericardium, the skin and subcutaneous tissue, and an implantation nodule developed on the endocardium of the left ventricle, but in both cases the capillaries of the liver afforded the best conditions for arrest and further growth and proliferation of the cells in the blood. Apparently the cells reached the liver through the hepatic artery rather than through the portal vein, because there were no metastases in the capillaries drained by this vein, but in view of the uncertain and accidental manner in which secondary tumors may arise, only conjectures in regard to this point are permissible. In the liver, however, the favorable conditions for cell-growth resulted in the development of a diffuse intracapillary growth, which replaced the

liver tissue proper while it largely retained the normal external conformation of the organ. In both cases this process is everywhere so far advanced that it cannot be said in what part of the lobule the cells were first arrested. As indicated, the capillary tumor cell emboli seem at first oftenest chromatophorous; as these cells proliferate large numbers of pigment-free cells are produced, and there result in this manner large districts, and in one case more distinct nodules also of non-pigmented tumor growth. It is a well-known fact that the cells of a metastatic melanosarcoma tend to lose their original physiological property of producing pigment. Ribbert looks upon the round, non-pigmented cells in such foci as incompletely developed. An exact explanation of the origin of extensive pigmented and non-pigmented areas with well-marked, definite margins cannot be advanced; it is easy to suggest that this feature, which was well marked in the second case, may depend upon accidental distribution of pigmented and pigment-free cell emboli.

There is absolutely nothing in the histological appearances, which are quite plain, that would warrant the inference, advanced by some, that the melanotic cells exercise a 'proliferative or "infectious" stimulus upon the cells with which they come in contact, leading to an active participation of pre-existing elements in the growth of the secondary tumor tissue; on the contrary, it is quite plain that the metastatic process that has led to replacement of the liver with tumor tissue is one of continuous intracapillary tumor growth, resulting in, so far as can be specified from the microscopic appearances, a mechanical pressure atrophy of the intervening liver substance associated with compression and occlusion of the structures in Glisson's capsule. As the capillaries and small vessels become packed with tumor cells the portal circulation is hindered, ascites develops, and, in one case, thrombosis of the intra-hepatic branches of the portal vein was induced. The development of ascites upon this basis—*i. e.*, occlusion of the hepatic capillaries by sarcomatous cells, to which attention was drawn in the report of the first case (*Transactions of the Chicago Pathological Society*, 1897, vol. ii.)—is exceedingly interesting, and does not seem to have been previously mentioned in the descriptions of this remarkable form of secondary sarcoma of the liver.

These cases deserve notice from a clinical as well as anatomical point of view.

In Case II. there was a clear history of the local trauma two years before the removal of the eye. This is so common in cases of melanosarcoma as to attract attention in all series of cases. Lawford and Collins¹ found local injury several months or even three years before the

¹ Lawford and Collins: Sarcoma of the Uveal Tract, with Notes of 103 Cases. Royal London Ophthalmic Hospital Reports, 1891, p. 104.

removal of the eye for melanosarcoma in 6.79 per cent. of cases. P. Wagner,¹ in nineteen cases of melanosarcoma, reports a history of trauma in five.

The frequency with which the liver is secondarily affected is commented upon by all writers. In our three cases the involvement of the liver was at the time of observation the predominating feature.

In Case III. the primary tumor was apparently in the eyelid, an unusual locality.

In the matter of diagnosis, we would emphasize the importance of careful inquiry as to the nature of existing eye troubles and of causes for extirpation of eyes seen to be missing. Further, painstaking search for cutaneous and subcutaneous nodules should be made. Many of these are extremely minute and to be detected only by diligent examination, their existence not being known to their possessor.

The extirpation of one of these nodules for microscopic examination is a simple matter, but of great aid in diagnosis.

While other causes for melanuria than melanotic neoplasm are not unknown—*e. g.*, malaria—the presence of melanuria or melanogen in the urine adds strong confirmatory evidence of the existence of a melanotic growth, in the liver, for example, if that be enlarged.

Melanogen is a colorless chromogen that first becomes black by oxidation, and is then called melanin (Litten). A single negative examination of the urine should not be regarded as excluding a pigmented tumor, for in some cases neither melanin nor its chromogen has been present, and in others the melanuria has been periodical. We would emphasize the value of control-tests with normal urine as greatly limiting the possibility of error. The question of the nature of these pigments in the urine is fully discussed by Litten. (Litten: "Ueber einen Fall von Melanosarkom der Lieber." *Deutsch. med. Woch.*, January 17, 1889.)

As to the configuration, size, and consistency of the liver, it may be said that in the diffuse infiltrating form of sarcoma the liver seems to preserve nearly the normal shape, though with its measurements greatly increased. It is hard, and if the abdominal wall be thin enough may be felt to be slightly roughened or coarsely granular. In the mixed form the surface may be uneven from nodules, and these may be hard or soft, fluctuating, and containing fluid.

The occurrence of ascites should not, as some authors state,² argue against sarcoma of the liver. Its clinical association without peritoneal origin is demonstrated by Cases I. and II., and the cause seems not obscure when we consider the pathological condition present, the plugging of the hepatic capillaries by sarcoma cells.

¹ P. Wagner: 19 Fälle von Melanosarkom. *Münch. med. Woch.*, August 16, 1897.

² Leube lays stress on the absence of ascites, "which, in sarcoma of the liver, is apparently invariably lacking." Tyson also makes a somewhat similar statement.

In our second case the small omental nodules did not seem a sufficient explanation of the fluid, which further possessed the characteristics of a transudate; specific gravity 1007. In our first case no cause for the ascites save the hepatic growth was discovered. In Litten's case, which was nodular, to be sure, there is no mention of involvement of the peritoneum, yet there was a moderate amount of ascitic fluid in the lower part of the abdomen. In our third case we believe, from the character of the fluid, that the peritoneum itself was the site of multiple metastases. That in sarcoma of the liver other causes for ascites than plugging of the vessels by sarcomatous masses may exist is, of course, true. A portal thrombosis, a sarcomatosis of the peritoneum, an accompanying nephritis or hepatic cirrhosis—as in Musser's case—may give rise to ascites. But the fact should not be overlooked that ascites may occur, and often does occur, in uncomplicated sarcoma of the liver, at least in the secondary infiltrating melanotic form.

We would add a word as to the value of examination of the fluid aspirated from the serous cavities in cases of suspected involvement of the lining membranes in melanosarcomatosis. In Case II. no pigmented cells were found, nor any cells of unusual size or shape or with nuclei showing atypical mitosis. The fluid was, further, of low specific gravity—1007—and resembled therefore in every respect a transudate. In Case III., however, where we believe the peritoneum was involved in the new growth, not only was the fluid of higher specific gravity, 1018, as in the exudates, but the cells were much more numerous, and many of them were large and in all stages of direct division and some revealed karyokinetic figures. Many cells contained reddish-brown pigment granules, as well as fat-drops.

The absence of pain and of gastro-intestinal disturbances and the slight alteration in the blood-findings seemed in Cases II. and III. rather remarkable, when we consider the advanced stage of the disease; for usually great disturbances in appetite and digestive power are met with in advanced malignant growth, and marked deterioration of the blood is commonly found in these conditions.

SUBARACHNOID SEROUS EXUDATION PRODUCTIVE OF PRESSURE SYMPTOMS AFTER HEAD INJURIES.

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THE practitioner not infrequently meets with cases of head injury in which moderate febrile movement and prolongation of unconsciousness, greater or less in intensity, tend to eliminate simple concussion, while

symptoms of irritation, combined with those of depression, unaccompanied by focal signs, point to more or less diffuse cortical lesion. If the discussion were limited to this class of cases it would be perhaps of no vital moment whether the diagnosis of contusion, bruising, or laceration were adopted, provided only the general condition is recognized, and no active steps are taken in treatment. When, however, to this symptom-complex is added a localized paralysis, whether affecting an arm, a leg, or the entire half of the body, and when, in addition, the depth of unconsciousness, for the first day or two at least, is sufficient to cause anxiety, the question of operative interference at once suggests itself. In such cases the importance of most definite ideas regarding the pathology becomes obvious. The autopsy, unfortunately, furnishes comparatively little clue, so that we are forced to rely somewhat upon theoretical considerations, supported as far as may be by actual observation on the operating-table.

It not infrequently happens in these cases that trephining over the area indicated by the paralysis shows negative result beyond revealing a tensely bulging dura, incision of which is followed by free flow, or rather gush, of clear fluid, the brain beneath presenting no laceration or other abnormality beyond, perhaps, oedema.

A few words will be here in place regarding the seat and purpose of the cerebro-spinal fluid. For the purposes of this discussion we may designate the arachnoid as a delicate membrane situated inside the dura and outside the visceral pia. This membrane closely approximates and is hardly separable from the visceral pia over the convolutions, but bridges over the gyri, and at the base of the brain is widely separated from it, leaving a very considerable space, the same conditions obtaining between the cerebellum and the bulb.

Under this membrane in the interval commonly designated the sub-arachnoid space the greater part of the cortical cerebro-spinal fluid is collected. Increase of cerebro-spinal fluid not only plays a compensatory part in case of lessened blood-pressure and cerebral atrophy, but results also from increased blood-pressure, as in meningitis, and again serves to relieve, according to Tilleau, the intense engorgement following forced expiratory efforts, as, for example, that produced by prolonged coughing. The transudation of this fluid under normal circumstances, as during tranquil respiration and ordinary cardiac systole, is, of course, accommodated for by nature and produces no symptoms. Under abnormal circumstances, however, the bulk of fluid is capable of rapid alteration, as a preservative effort on the part of nature, whether to relieve vascular tension on the one hand or to fill a vacuum on the other.

The transudation of cerebro-spinal fluid is certainly a very rapid process, and no less rapid is the exudation of serum in the cuticle after bruising, whether the fluid shows itself by infiltration of the tissues or

by the localized cavity formation known as a vesicle. There is no reason to suppose that the brain is less liable than other tissues to show congestion and œdema after local bruising, or that an exudatory effort on the part of the bloodvessels would be more tardy than elsewhere in a region in which relief of congestion is of vital moment. Whether the accumulation of fluid following a bruise of the brain has simply the characteristics of cerebro-spinal fluid, or whether it partakes more of the nature of serous exudation, is an easy matter to verify by chemical analysis. The opportunity has not presented itself to the writer since commencing this communication, but we may safely assume the process to be exudatory. There is in either event no theoretical reason why rapid local increase of subarachnoid fluid, with or without accompanying œdema of the brain substance, should not follow local bruising and swelling of the cortex, or its general increase follow diffuse injury. We have, in point of fact, something more than theory to rely upon, such accession of fluid being not infrequently demonstrated by operation.

That a more or less diffuse œdema, whether involving the subarachnoid cavity or the brain itself, or both, and whether accompanied or not by marked laceration, may play a part in prolonging the general symptoms of concussion, seems a not improbable supposition; it is not, however, of this class of cases that I would speak at length, but rather of those cases in which local paralysis of more or less temporary nature accompanies such general symptoms, the pathology being here, I apprehend, a local accumulation of fluid under the arachnoid resulting from rapid exudation at the point of most marked bruising, whether the result of direct violence or of *contrecoup*.

Park has drawn attention to the close adhesion of the arachnoid to the pia at the vertex, excepting where the former membrane bridges the gyri, and as a caution in cerebral irrigation he mentions a case of Macewen, in which about two ounces of fluid were injected apparently into the subarachnoid space and retained. In this case a pressure paralysis ensued and lasted four days. This striking though inadvertent experiment absolutely demonstrated the fact that fluid may remain practically imprisoned under the arachnoid, the condition exactly approximating that of a blister of the cuticle.

Local cerebral œdema has been already suggested (Edes) as sufficient cause for temporary paralysis in medical cases, and Bullard especially has called attention to the fact that the pressure of such œdema may extend, in hemorrhage, the paralysis beyond the region implicated in the original lesion, but little attention has been paid to such pathological conditions as I have indicated, resulting from localized trauma. Trauma has been mentioned, *e. g.*, by Quinke¹ among other causes for serous

¹ Quinke: Volkmann's Sammlung klin. Vorträge, N. F., 1893, No. 67; also Deutsche Zeitsch. f. Newenheilkunde, November 12, 1896, 9 Band, 3 and 4 Heft.

meningitis. The few cases cited by the author, however, in which trauma played a part were of a rather different type from these cases to which I would call attention, the symptoms of pressure being more marked, the optic nerve even becoming atrophied in one case, and blindness following. Lumbar puncture in this case showed marked increase of pressure and a very considerable escape of serum with specific gravity 1008. In another case of chronic hydrocephalus, with acute exacerbation and death at the age of thirteen years, the influence of a fall at the age of five years was very doubtful.

The extremely suggestive work of this author deals in general with internal rather than external increase of fluid. Still the analogy is striking between the symptoms of Quinke's serous meningitis and those of the cases under discussion. Slight febrile movement at the onset of acute cases, headache, restlessness, and vomiting (not constant), dulled sensorium, with or without delirium, sluggish pupils, and occasional local paresis, characterize both. The variation in intensity of symptoms is similar. The frequency of optic neuritis, however, followed by atrophy, in Quinke's cases, together with the retraction of the head, affords a decided contrast to these cases under discussion, while, on the other hand, the complete paralysis leading to suspicion of hemorrhage does not appear to be noted in the cases of typical serous meningitis. In fact, lack of definite local symptoms constitutes one of the diagnostic features of the latter disease as distinguished, for example, from tumor.

In the following fairly typical example of the class of cases to which I will call attention the symptoms were so far suggestive of hemorrhage as to lead to serious question of operation :

CASE I.—A boy of six years, with a negative history, excepting that he is said to have had meningitis and hydrocephalus at eighteen months, and that he is said not to be particularly forward in school training, was struck by a bicycle at noon. Was dazed but not unconscious. That evening he had fever and vomited. He slept until midnight naturally, was then restless until daylight, and at 9 A.M. vomited again. At 1 o'clock the next day, when seen by Dr. Percy, the attending practitioner, he was drowsy, and during the afternoon became unconscious, paralysis developing on the right side, including the arm, leg, and face. The right pupil was larger than the left, but reacted to light. The knee-jerks were present, and the plantar reflex was more active on the left. Defecation and micturition were involuntary. There was a contusion behind the left ear, pressure upon which caused him to cry out.

At 9 P.M., when seen by Dr. Scudder and myself with Dr. Percy, the temperature was 102°, the pulse 96. He could be roused more easily than at six o'clock, and at times spoke coherently when questioned. The facial paralysis was less marked, and the right arm and leg were moved somewhat.

The case up to this time had appeared very suggestive of middle meningeal hemorrhage, and if his condition had steadily grown worse instead of slightly improving, at this time operation would have been

strongly urged. In view of the improvement, and in consideration of the age of the patient, it was decided not to operate at once, but to have him removed to the hospital, prepared for operation, and carefully watched.

On being brought to the hospital at 11.30 P.M., he was still drowsy, but could be roused a little and asked for water. The pupils had become equal and reacted. The pressure-symptoms had already lessened, the right arm and leg being moved, though not so freely as the left. There was still slight facial paralysis on the right. The knee-jerks were now absent. Behind and a little above the left ear was an area of great tenderness, with œdema of the scalp. No depression was found. The patient was put to bed, with heaters, and a special nurse appointed to watch for increasing coma, paralysis, or spasms.

During the night the patient was restless and turned constantly. In the morning the paralysis had lessened still more. He was much brighter, and took liquids. A slight ecchymosis appeared behind the left ear. Some headache was present. Dejections were involuntary. On the second day of his stay in the hospital—that is, the fourth day after the accident—he was restless and fretful during the night, crying out at times with headache. He was given ten grains of bromide of potassium and an ice-bag applied. Was still somewhat drowsy, but inclined to talk at times. The pressure symptoms had disappeared. On the fourth day of his stay at the hospital the child was apparently well, and eating and sleeping well. He was kept under observation ten days longer, during which time an acute inflammatory throat trouble appeared, evidently a coincidence, and he was discharged apparently well two weeks after admission.

Dr. Percy tells me that about three weeks later diffuse swelling of the left side of the face appeared and persisted for a week. The swelling included the lids and extended to the neck and behind the ear. There was no discoloration except in a slight degree under the eye. Whether this symptom bore any relation to the accident I shall not attempt to decide.

Another case of temporary paralysis, occurring in a child, was seen by me with Dr. Boland, of South Boston, who has kindly furnished the following report:

CASE II.—L. D., aged three and one-half years, was thrown to the floor from a child's doorway swing. Her mother was swinging her carefully, when one end of the rope slipped from the suspending hook, and the child was thrown to the floor, striking on her head. The mother was alarmed because the child only moaned and did not cry. I saw the child within an hour and found her dazed. I gave a good prognosis. However, the mother soon noticed that the child could not hold her head up, did not take notice, though she could be roused, and spoke "Mamma" appropriately, also that she vomited. The next day it was noticed that her left arm was useless, and the left occipital region was tender, or at least she flinched when it was pressed, though no ecchymosis or swelling could be seen. The following day Dr. Walton saw her with me. She was so constipated that I had to give her high rectal enemas to secure an operation.

About three days after the injury it was deemed best to send her to

the Boston City Hospital, with a view to operating if paralysis persisted. Over-crowding caused a delay of twelve hours, and then it was noticed that she began to use her left hand. From this on her convalescence was rapid, and she soon showed no remains of the accident. She is now a bright, pretty child of five and a half years, and is as bright in school as any of her age.

This patient also narrowly escaped surgical interference, my hesitation in advising operation arising rather from general considerations than from a definite idea of the pathological process.

I am now inclined to believe that the lesion in each of these children was localized subarachnoid effusion, resulting from a bruise, and followed by rapid absorption of the fluid.

For absolute demonstration that such accumulation of fluid can take place we have to depend rather on the operating than the autopsy-table, and the following case, reported in full by Dr. Brooks and myself in the *Boston Medical and Surgical Journal*, presents a sufficiently obvious illustration :

CASE III.—A young woman, thrown from her horse, struck her head violently against a rail, and was carried home unconscious. Four hours later was still unconscious, breathing quietly, with a pulse of 100. The pupils were alike, somewhat dilated, and reacted sluggishly. There was partial paralysis of the left side of the face, and complete paralysis of the left arm and leg. The patient had vomited after the accident. There was a hæmatoma in the right mastoid region. The patient was taken to the hospital.

Restlessness supervened, and consciousness partially returned. Respirations were shallow; there was incontinence of urine. The left arm and leg became rigid.

On the second day the rigidity of the left arm and leg became less marked, and limited voluntary movements appeared. No marked improvement having taken place, however, at the end of thirty-six hours, it was decided to trephine.

Operation. A small trephine button was removed about two and a half inches above the external auditory meatus. The dura, which was in close proximity to the skull, was slightly nicked, and a quantity of clear serum escaped from the opening. The dura was tense and bulging, and on its incision about half an ounce of clear serum spurted out. The brain appeared somewhat œdematous and prominent, but otherwise normal.

On the third day the left arm and leg moved somewhat and were less rigid. The patella reflex was still absent. On the fourth day the movements of the left arm and leg exhibited further improvement, and the patella reflexes had returned. There was less difference between the two sides of the face.

On the fifth day the left side was used much better, and there was little, if any, facial paralysis. From this time on the general condition varied from moderate delirium to somnolence, a fair amount of nourishment being taken by the mouth. The patient gradually sank, and on the fifteenth day the temperature, pulse, and respirations rose rapidly and she died on the sixteenth day. The autopsy revealed no gross lesion

sufficient to explain the fatal termination. Two hemorrhages about the size of beans were found in the left frontal lobe, and various minute hemorrhages were scattered over the brain.

The mechanism of death in this case is somewhat obscure, but the number and extent of small hemorrhages show that the blow must have been an extremely violent one, and it would almost seem that the brain was unable to recover from the general disintegration thereby produced. For the unilateral paralysis there seems absolutely no plausible explanation, except the pressure of the fluid, and the relief of paralysis was apparently due to relief of this pressure. The fluid would doubtless have been absorbed in any event in a few days, and it is a question whether the operation had any decided effect one way or the other upon the progress of the case. In reporting this case Dr. Brooks and myself stated that it seemed probable that the diagnosis of cerebral œdema would appear more prominently in the future than in the past as a cause of pressure symptoms, though the relation between these cases and those of so-called serous meningitis had not definitely occurred to us.

That this local accumulation of fluid may appear in other than traumatic cases is shown by a case in which Dr. J. Orne Green operated for temporo-sphenoidal abscess of aural origin. Localized convulsions and paresis appeared later in the opposite arm, giving rise to the assumption that infection had extended to the arm centre. Operation was performed at this point by Dr. Homans; an incision of this membrane was followed by a gush of clear fluid. Further exploration of the brain revealed nothing beyond an œdematous condition. In this case it would appear that some obscure vasomotor influence had produced local transudation. Possibly some obscure reflex nervous irritation determines such conditions, as suggested by Quinke in comparing local cerebral œdema with transient peripheral swellings, as of the face. It is not improbable that the temporary paralyses of general paralytics owe their origin sometimes to local serous exudation.

The practical bearing of this discussion as regards traumatic cases is upon the question of surgical interference. In two of the cases here mentioned operation was undertaken, and in the other two it was seriously considered and prepared for. The result of the operation was in both cases negative, the severity of the underlying condition in each being so great as to preclude recovery. In the other two cases absorption of fluid was apparently rapid and recovery perfect.

It is of great importance to have this class of cases in mind before operating for supposed meningeal hemorrhage. The following diagnostic suggestions were offered by Dr. Brooks and myself, based upon our experience:

1. In case of hemorrhage the unconsciousness, as a rule, after once appearing has steadily deepened.

2. The other symptoms show, as a rule, *steady* and *continuous* progression.

3. The insensibility to pain is generally profound in case of hemorrhage after unconsciousness is established.

4. Inequality of pupils is likely, though not certain to be present, in hemorrhage.

The cases under consideration, on the other hand, have run a comparatively atypical course, and pressure over the hæmatoma has generally given rise to signs of discomfort, long after the unconsciousness has been so profound that no response to questions could be elicited. The pupils have generally been alike, though reacting sluggishly to light. Diminution or absence of knee-jerk has been a fairly constant symptom.

With regard to the question of operation, if the atypical course of the case tends to eliminate hemorrhage, I should favor delay, even though localized paralysis be present. This is especially true in children, not only because they appear particularly prone to temporary paralysis after blows upon the head, but also because operation is borne much less well in early life, and there is always the fear lest the surgical operation may precipitate a fatal issue.

CONCLUSIONS.

First. A severe blow on the head may result, either directly or by *contrecoup*, in a local bruising, congestion, and swelling of the brain-tissue, with serous exudation into the subarachnoid space, either with or without œdema of the brain substance.

Second. If this accumulation of fluid occurs over the motor centres it may be imprisoned so as to cause focal pressure symptoms, simulating meningeal hemorrhage.

Third. This accumulation of fluid is not compensatory, but represents an ineffectual effort toward relief of tension, as shown by the swollen condition of the underlying brain substance when exposed by operation. The mechanism is probably analogous to if not identical with that of the so-called serous meningitis of Quinke.

Fourth. The lesion is self-limiting, the resulting paralysis disappearing in the course of a few days.

Fifth. This condition may be mistaken for middle meningeal or middle cerebral hemorrhage. The diagnosis is difficult and sometimes impossible. Factors aiding in the diagnosis are (*a*) an atypical course, (*b*) absence of steadily increasing coma, and (*c*) the appearance of sensitiveness to pain on manipulation of the head, even after the unconsciousness is so great that questions are not answered. The general symptoms (restlessness, stupor, headache, and moderate febrile movement) may be the same in both conditions.

Sixth. The mere presence of paralysis following a blow upon the head

is not necessarily an indication for immediate operation, and in the absence of steadily deepening unconsciousness and of steady progression of other cerebral symptoms, it will be often wise to postpone surgical interference, though generally speaking an exploratory operation is always justified in case of focal paralysis following head injury.

Seventh. This lesion is to be particularly borne in mind in the case of children and young adults, and perhaps in alcoholic patients. In elderly patients the same set of symptoms points more decidedly toward hemorrhage.

THE PATHOLOGY AND MORBID ANATOMY OF HUNTINGTON'S CHOREA, WITH REMARKS ON THE DEVELOPMENT AND TREATMENT OF THE DISEASE.

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INTRODUCTORY REMARKS. *Point of view.* In attempts to solve the problems imposed upon the neurologist by the exigencies of his specialty, many difficulties are encountered. Of these none has the secret of its genesis and being more carefully concealed than the hereditary degenerative diseases. The pathogenesis of the acute inflammatory diseases of the nervous system is an open book. The process is essentially the same as that of acute inflammation in any other tissue, individual attributes and variations being conditioned by structural peculiarities. It is in reality the reaction of the tissues to different forms of irritation, principally bacterial. The degenerative diseases, on the other hand, yield the mystery of their being and causation in a discouragingly slow way. This is true especially of the degenerative diseases that are handed down from generation to generation, such as the hereditary ataxias, choreas, and dystrophies. Although we may apprise ourselves fully of the terminal morbid anatomy of such diseases, it is almost as impossible to infer the pathogenesis of them from a study of their morbid conditions alone as it is from a consideration of the symptoms. In other words, the status of the beginning or original lesion cannot always be inferred from a consideration of the morbid conditions found at the time of death, particularly if the disease has existed a great number of years. This statement may sound heretical, but I am convinced that it does not materially overstep the boundaries of truth. No one can spend his days in the laboratory at work on the central nervous system of individuals who have succumbed to degenerative nervous diseases of

¹ Read before the Neurological Society, November 2, 1897.

protracted duration without having forced upon him the fact that there are certain abnormalities of the circulatory system, consisting of a variable degree of degeneration of the vessels, change in the size of the lymph spaces, and relative disproportion of glia tissue to the parenchyma, which occur with all degenerative diseases, considered entirely apart from their causation. The longer I study the morbid anatomy of the degenerative nervous disease, the more I am convinced that we cannot be too chary of attributing such departures from normal, as these just enumerated, to the direct effect of the action of the factors to which the disease is attributed. On the contrary, I venture to believe that these terminal changes are very often secondary; that they are entitled to no other significance than evidences of protracted disturbance of nutrition, and that this nutritional depravity results from the functional disorder of the part or the organ as well as from the existence of the original lesion. There is nothing more certain than the occurrence of glia proliferation in all slowly progressing destructive lesions of the nervous system; but nothing can be more misleading, in my estimation, than the idea that this glia overgrowth is primary, and the changes in the parenchyma secondary. The fact that the overgrowth of glia is most frequently into the pericellular and perivascular spaces has led to the belief that it is responsible for the changes in the cells which are found accompanying such proliferations. This is a return to a theory which few pathologists accept to-day, viz., the theory advocated by Bevan Lewis that the glia cells have scavenger properties and attack diseased nerve fibres and cells.

A retrospective glance of the contributions that have been made to the morbid anatomy and pathogenesis of the hereditary degenerative disease known as Huntington's chorea prompts the foregoing remarks. The disease is comparatively rare, and of somewhat recent recognition. Consequently, the luminous contributions that have been made to its pathological history are very few. Moreover, the reports that have been made are not uniform regarding the conditions found macroscopically and microscopically. Thus, one writer contends for the genetical relationship of the diseased tissues to the vascular system; another that the beginning of the pathological process is in the cells; while others maintain that the primary manifestations of disease are in the neuroglia. These discordant views are, I venture to suggest, the resultant of varying points of view of different observers. We should bear in mind, when given opportunity to study the central nervous system of cases of Huntington's chorea, that it is scarcely justifiable to contend that all the morbid conditions found microscopically are inherent to the disease. They may or may not be. Many of them, as I have said, may be the consequence of prolonged interference with nutrition. Naturally, it must be granted that this interference with nutrition becomes a part

of the disease ; but it is incidental, not essential. It follows, therefore, that study of cases of Huntington's chorea in which the anatomical material has come early to the investigator's hands through some accidental cause, such as the fatal outcome of one of the acute diseases, is of greater value in illuminating the pathogenesis of the disease than is study of cases that have died a natural death after the disease has run its full course. Although the investigation of Huntington's chorea which I present herewith was made on the nervous system of an individual who had the disease for a number of years, I shall take occasion to compare the findings and contrast them with a case reported by Dana about three years ago. It will be seen that the findings are very similar in the two cases, although the patient reported by this writer had been afflicted with the disease but a comparatively short time, and died from an attack of typhoid fever.

Together, they may contribute toward establishing the morbid anatomy of this disease and toward indicating the pathogenesis. They may, perhaps, necessitate a modification of the statements made by some modern writers on chorea, such as Osler and Blocq, to enumerate two of the most recent, who state, the first, that nothing has yet been found to explain the true nature of the disease, and the second, that it is not yet possible to say what the anatomical substratum of the affection is.

HISTORY OF THE CASE. The history of the patient, so far as I have been able to ascertain it, is as follows :

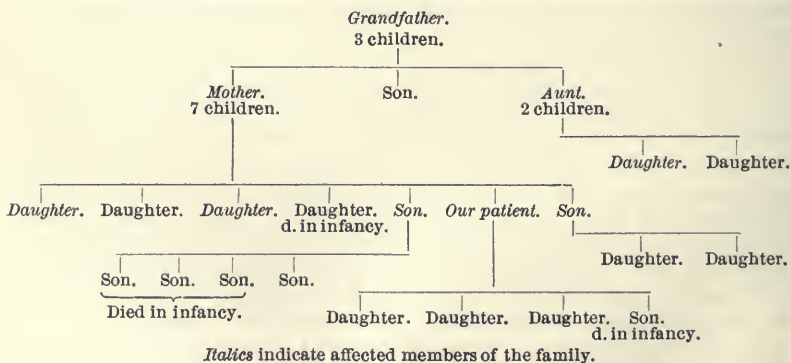
An American gentleman, aged fifty five years, married in early manhood and begot four children, three girls and one boy, the latter of which died in infancy. His wife lived but a short time after the birth of the last child, which is now ten years old. His ancestors were settlers of upper Manhattan. They had been large families, and the victims of a disease, characterized by jerking, uncontrollable, dance movements and mental decay, showing itself in early middle life, which led some of its victims to asylums and others to voluntary seclusion. The disease from which they suffered is the one now known as Huntington's chorea.

Mr. X., fully and intelligently aware of his heritage, was quite well until the forty-fourth year of his age ; at least, it may be said that, although he had been very sensitive to comment or discussion concerning his health and very nervous and somewhat bizarre in his movements before that time, he was still able to transact business. From the time when the disease first showed itself in sufficiently definite form to be diagnosticated until the time of his death more than ten years elapsed. In the beginning the twichings or choreiform movements involved only the hands, but within two years from the time of their advent they were to be seen in the cephalic extremity, and in the last years the face and tongue, and eventually the lower extremities were much affected. I have been assured that the legs were last involved, and that the gait did not show the rather typical " halting, stalking " feature that has been so often commented on by reporters of these cases. His mind remained in fairly good condition until about three years before death, when he

began to have suspicions of his family and of his friends. He was with difficulty convinced that they were not plotting to put him in an asylum and to separate him from his children. He became depressed, sometimes suicidal, very forgetful, and distrustful of those on whom he had had the greatest reliance. His most persistent concern was to prevent separation from his children. Gradually he withdrew from association with his friends in society and in business, and kept near his children. The movements of the upper extremities and face were such that his appearance on the street attracted attention, and this made him loath to go abroad. In the last years of life speech became indistinct, and for several months before death it was with difficulty that one understood him. For a few weeks before he died the movements of the face and tongue were so severe that he rarely attempted to speak, and when he did the result was a mere verbigeration.

I saw him for the first time a few days before his disease terminated. He was apparently suffering from some acute illness, although nothing could be made out from physical examination save the choreiform movements and hyperthermia. The statement of the patient's family was that latterly the choreic movements had steadily increased in intensity, and that the mind had become very much clouded. About a fortnight before his death a fever developed, which remained with him until the end. When I saw him the temperature was 105°, and thereabouts it continued until the time of death, several days later. At this time the movements, although very severe, were not sudden and bizarre, but irregular and made worse by volitional intent. They were very severe and incessant, except during profound sleep. Even then they were seemingly disturbing and the cause of frequent awakening. Although the patient was quite conscious, he made no verbal responses or requests. The movements of the face and tongue were conspicuous and severe, and the irregular twitchings of the body so profound that he had to be maintained forcibly in bed. Aside from evidences of senility, the examination showed nothing of sufficient interest to require mention. There was slight rigidity of the extremities, but there was no exaggeration of the reflexes. The cause of death seemed to be exhaustion and high temperature.

The family history is shown graphically by the following scheme :



Summary of the family history. In brief, illness of this nature is traceable in the patient's ancestry to the maternal grandfather, an Irishman.

Whether or not the taint could be traced further back, if access were had to the family records, it is impossible to say. Of the children of this grandfather three in number, two daughters were affected. One of these daughters was mother to our patient, and bore seven children, five of whom became afflicted with the disease. The other daughter bore two children, and of these one became choreic. In three generations there have been no less than nine members affected, and when the fact that many children of these families died in infancy is considered, the number of cases that have developed is surprisingly great. The disease has not yet manifested itself in the children of the third generation, but evidences of neuropathic inheritance are to be seen in almost every one of them, and the children of our patient possess a number of striking somatic stigmata of degeneration.

Post-mortem findings. The notes of the autopsy, made four hours post mortem, are as follows: The body, showing slight rigor mortis, is but little emaciated. There is marked panniculus adiposus, and when the abdominal cavity is opened the organs present a healthy appearance, save that the tip of the appendix is adherent to the colon. The lungs show a few calcareous deposits and old adhesions at the apices, and one of these adhesions on the left side binds the pleura above to the mediastinum; another, below, to the diaphragm. There is a considerable deposit of subpleural fat, and both lungs are slightly emphysematous. The pericardial sac contains a customary amount of fluid; the heart is small, and, to the naked eye, presents the appearance of slight fatty infiltration. The valvular apparatus is normal, the endocardium quite smooth, and the large bloodvessels at the base of the heart are soft. The liver is of normal size, weight, and consistency; but cross-section reveals a considerable degree of fatty infiltration. Save for a slight increase in volume, the spleen is normal, both *en masse* and when cut across. The only feature worthy of remark shown by the pancreas is a rather uncommon state of the bloodvessels. The walls of the vessels are hard, the calibre is increased, and the lumen is excessively patent. The kidneys show no departure from normal, with the exception of an ancient and rather well-marked scar at the upper end of the left kidney. The capsule is easily stripped, and when the kidneys are laid open the markings of the cortical and medullary parts are very indistinct, and there is marked venous congestion. All the visceral organs are richly embedded in fat. The intestines are quite normal, and nothing whatever is found to account for the hyperthermia which the patient had, or to point the cause of death.

On opening the skull the dura was considerably adherent, the diploë dense, and the Pacchionian depressions well marked. In the lower end of the longitudinal sinus there was a small coagulum. There were a number of adhesions between the pia and the dura over both hemispheres, more on the left than on the right. These areas of adhesion are not at all firm. There is slight excess of cerebro-spinal fluid, and the brain has a "wet" appearance. The pia is not adherent on the internal surface, but while it is in contact with the brain it has a congested, thickened appearance. This is particularly noticeable over the pons, where the arborization is striking; but when the pia is stripped, it has its customary appearance. The convolutions of the anterior pole of the brain seem very small, and the central convolutions are strikingly narrow. The weight of the entire encephalon was forty-three and one-half ounces.

When the spinal canal was opened considerable fluid was found in the cerebro-spinal space, and after incision of the membranes more than three ounces of this fluid was collected. The cord presented a "wet" appearance like the brain. The most remarkable feature of the meninges of the cord was that the dura was intimately adherent to the spinal column. Instead of hanging loosely, as it does naturally, it is adherent throughout its entire length, so that the dura and the posterior spinal ligament are one.

Abnormalities of the brain, as indicated by measurements. Inspired by the careful and exact study of the brain made by Dr. Charles L. Dana in the case of Huntington's chorea reported by him, I made not only a close examination of the brain for fissural and convolucional anomalies, but also a large number of measurements to determine the relative thickness of the gray matter of the cortex. The first awarded nought, as there seemed to be less evidence of variation than it is customary to find in routine examination of brains. The principal fissures were wider, shallower, and shorter than they are normally, and this is particularly noticeable in the central fissure, which is but a trifle more than ten centimetres in length. But there is nothing that points to defective evolution in the unfolding of the brain. Perhaps the most conspicuous feature of the brain in the fresh state is a cribriform or sieve-like appearance of the cortical and subcortical substance, to be seen very strikingly on cross section of the Rolandic region, and a peculiar mottled or tier-appearance of the cut brain substance. The brain seemed excessively vascular, both *en masse* and when cut into, but there were no foci of hemorrhage, and the vessels on the surface were in a good state of preservation.

The frontal convolutions and the motor areas of the brain were taken for special study. The anterior and posterior Rolandic gyri, in length ten centimetres, were divided into three parts. The first portion, that is, the portion bordering the longitudinal fissure, was cut into three pieces, and the first put in absolute alcohol, in preparation for Nissl's stain; the second in osmic acid, for the Golgi method; and the third in Müller's fluid, for the reception of Weigert's and Van Gieson's stains. The second third of the motor convolutions was treated in the same way, and likewise the last third, the inferior end. The motor gyri of the left hemisphere were disposed of in a similar way except that No. 1 was put in osmic acid, No. 2 in Müller's fluid, and No. 3 in alcohol. The remainder of the brain was hardened *en masse* in Müller's fluid, save a few pieces taken from the different lobes, which were put in alcohol. After the hardening process was complete ten measurements were made of the cortex of the surface from the different lobes. The averages of these measurements are here given.

	Centimetres.		Centimetres.
First frontal . .	2.60	Inferior parietal . .	2.88
Second frontal . .	2.55	First temporal . .	2.90
Third frontal . .	2.55	Second temporal . .	2.95
Ascending frontal . .	2.46	Cuneus	2.35
Ascending parietal . .	2.48	Precuneus	2.48
Superior parietal . .	2.82	Island of Reil . . .	3.60

Contrasting these averages with what has been determined to be the average thickness of the gray matter, we see that they are uniformly

less than the normal cortical gray. I do not forget that the individual whose brain we are studying was of an age when occasionally senility makes itself manifest in the brain, but the pronounced thinness found here cannot be attributed to age. Comparison with the result of measurements in Dana's case,¹ and in the more recent one of J. M. Clarke,² shows that the cortex was somewhat thinner than in the former's patient and more nearly approaching Clarke's case.

RÉSUMÉ OF THE MICROSCOPICAL FINDINGS. I shall preface what I have to say concerning the changes that were detected microscopically by the statement that, although they were not found exclusively in the Rolandic region and in the adjacent frontal gyri, the disease process was incomparably more advanced and conspicuous in these regions, more especially in the former, than in any other part of the brain. I shall not give a detailed account of the slightly varying conditions to be found in each specimen, but rather a *résumé* of the findings in each of the differently handled pieces. I am unwilling to say that specimens from one hemisphere show any pathological changes which would serve to differentiate them from specimens taken from the other hemisphere.

The specimens that were stained with methylene-blue, according to the Nissl method,³ reveal more clearly than any of the other stains the abnormalities of the cortical cells, although the differentiation in cell constitution is not well-marked, and one cannot see any actual change in the chromatic structure. The most conspicuous feature is the pigmentation and shrinkage of the cells, particularly those constituting the layer of large pyramids. (Fig. 1.) The cells just beneath this layer, the so-called polymorphous cells, are pigmented to a lesser degree, but still conspicuously. The next most striking abnormality is the size and shape of the cells of these two layers. The cell processes are attenuated, spiral, and shrunken. The cell-bodies are uniformly rounded, or slightly irregular, and many of them are not much greater than one-half the normal size. (Fig. 2.) All the cells of any given area are not affected, and many of them are diseased in different degrees. The cellular implication seems to be in tiers or streaks, and to this was due the mottled appearance of the cortex observable in the fresh brain. The fact that this mottling was noted when the brain was first examined points conclusively to the fact that the shrinkage of the cells was not incidental to the process of preparation to which the tissue was subjected in hardening and staining. The pericellular spaces appear very much larger than normal, but this increase in size is more relative than actual. In the pericellular spaces there is a remarkable accumulation of neuroglia nuclei seen spinning themselves out over the body of the pigmented atrophied cell, or clinging to the outer coat of a bloodvessel. (Fig. 3.) This manifestation of proliferation of glia nuclei is more evident in the deeper layers of the cortex than in those of the superficies,

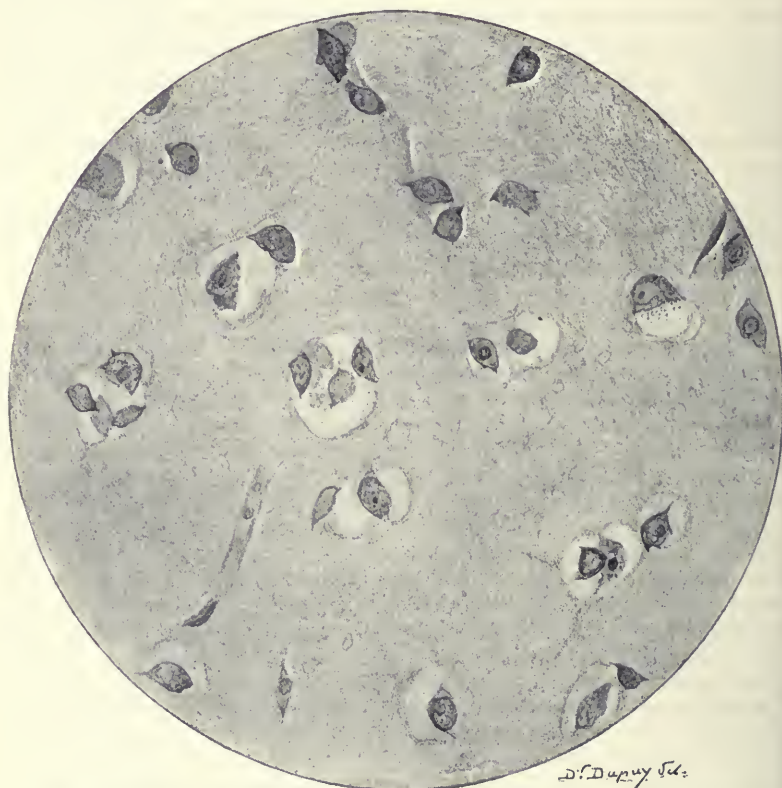
¹ Journal of Nervous and Mental Diseases, 1894, p. 565.

² Brain, 1887, p. 26.

³ In the preparation of the methylene-blue sections I received much highly valued assistance from my friend, Dr. B. Onuf, and I wish to express my appreciation of his courtesy and good offices.

and particularly in the polymorphous cells and in the layer of large pyramids. The bloodvessels in specimens made with this stain are thickened, principally the result of proliferation of the nuclei of the intima. The evidences of vascular degeneration are slight, and the change in the bloodvessels is not comparable to the change in the parenchyma about it. These lesions of the gray matter were found throughout the Rolandic region, some sections showing them more prominently than others.

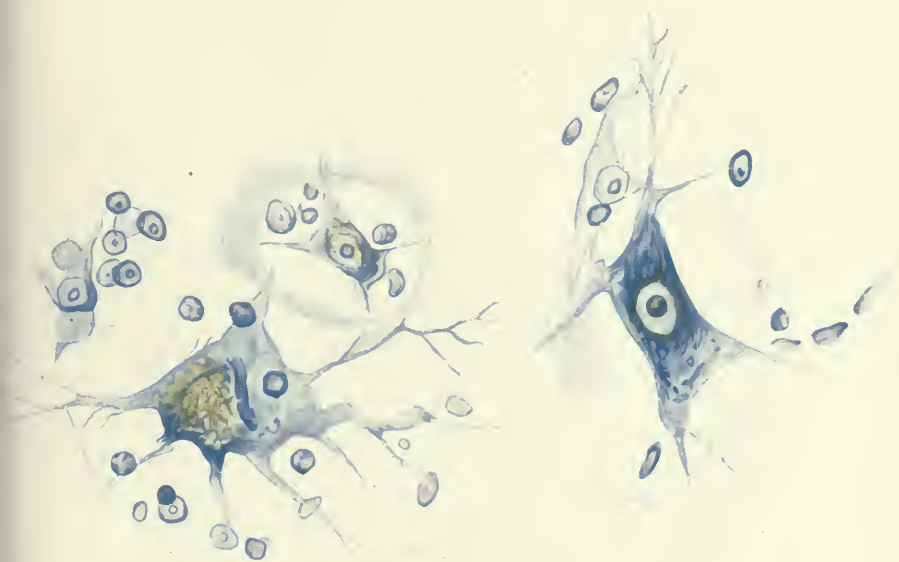
FIG. 1.



Pigmentation and shrinkage of the cortical cells and enlarged pericellular spaces.

Specimens stained with carminate of soda and with picric acid fuchsin showed the thinness of the cortical mantle which had been remarked in the fresh brain. The pia presented a comparatively normal appearance—possibly a slight degree of thickening. The most conspicuous feature of the specimens and one that immediately arrests the eye is a cribriform state of the tissue. (Fig. 4.) This is rather uniformly distributed throughout the specimens, but more marked in the inferior cortical layers, and it is due to three factors: (1) Shrunken ganglion cells; (2) enlarged and empty pericellular spaces; and (3) distended capillaries, arterioles, and perivascular spaces. The relative importance of each of these factors in contributing to the cribriform state is indicated by the

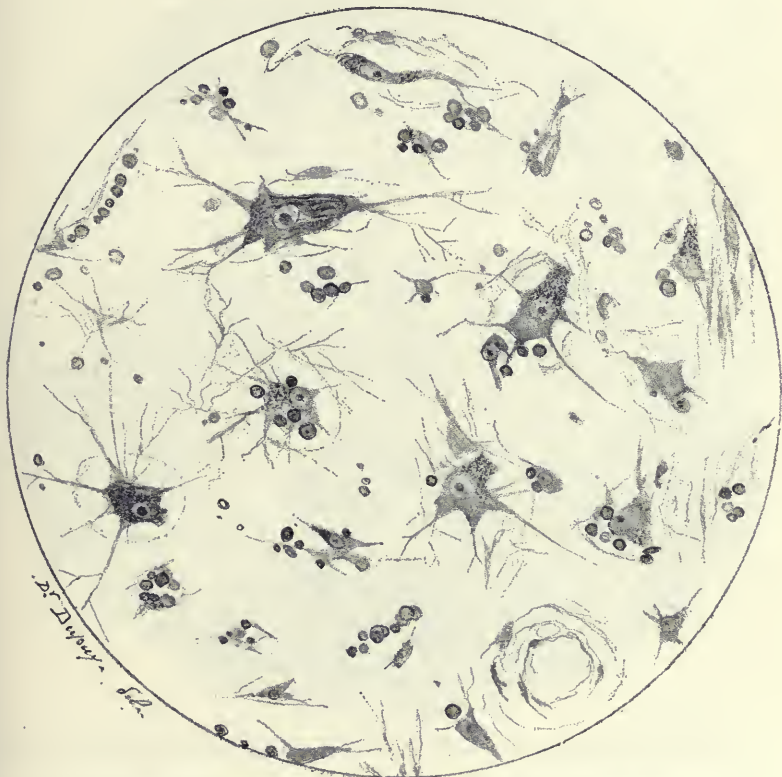
FIG. 2.



Cells from the layer of large pyramids, showing pigmentation, degeneration and pericellular distention. (Nissl stain.)

order of enumeration. When we study these three conditions individually we find that the departures from normal within the cell itself are practically the same as were determined by the methylene-blue stain. All the layers of the cortex are affected, but mainly the deeper layers, and the involvement is not uniform—*i. e.*, the same disposition to involvement in streaks already noted is here evident. Moreover, this streaky appearance is heightened by the fact that in the strands where the atrophied cells are most conspicuous many cells have completely disappeared. This stain does not permit a study of the intimate con-

FIG. 3.



To show the embracing of ganglion cells by glia cells. (Nissl stain.)

stitution of the cell save in its reaction to the coloring agent. Many of the cells take the stain very incompletely, while others take it in an irregular fashion, which gives the cell a granular appearance. The embracing of cells by glia prolongations is to be seen with this stain much less distinctly than with the methylene-blue and silver stains. Although the calibre of many of the bloodvessels is enlarged and the lumen of increased patency, these conditions are more noticeable in the white matter than in the gray. In the latter the thickening of the vessels has caused a lessening of the calibre in one portion and an irregular bulging in another. There is nothing approaching excessive

vascularity or perivasculitis. The increase of neuroglia tissue is general, and the glia cells and fibres have accumulated in the pericellular spaces, and here and there they are to be seen on the walls of the vessels.

The most striking feature of specimens stained with hæmatoxylin are thinness of the cortex and the delicacy with which the medullated components of the cortex color.

FIG. 4.



D. Dupuy Sed.

To show atrophy of the cells and cribriform state of the cortical tissue. (Van Gieson's stain.)

Specimens prepared after the Golgi method and after Berkeley's modification of it were not, on the whole, as satisfactory as the others. The greatest service that this method of staining rendered in this case was to corroborate that which had been determined by other methods. That is, it showed that the cells were not uniformly diseased; that normal, dead and dying cells were to be seen; and that the layer of large pyramids and the polymorphous cells were most diseased. The affected cells revealed their shrunken appearance and irregular outline most prominently in the deeper layers. The processes themselves, stunted and thin except where node-like enlargements have increased their calibre, are evidently much altered, especially the dendrites. Most of the dendritic

processes are quite devoid of thorns, and their inter-ramification seems less intricate and complex. The abundance of neuroglia tissue is very manifest in the preparations made with this stain, and it showed the same environmental proclivities as the specimens made with methylene-blue.

What has been said applies to the Rolandic region of the cortex. I desire to emphasize that the pathological conditions were not limited to this area, but were found to a certain degree throughout the entire brain. Sections made from the occipital and the parietal lobes revealed changes in the ganglion cells and in the bloodvessels and their surroundings which are comparable to those described in the Rolandic region, the difference being one of degree. In the frontal gyri certain specimens show the atrophic changes in the cells and the enlarged size of the perivascular spaces nearly as conspicuously as those taken from the motor areas, but the lesion is less widely distributed there, and is less advanced. In other parts of the brain there are comparatively slight changes in the parenchyma and in the supporting tissues.

FIG. 5.



D. Dupuy del.

Showing degeneration of the crossed pyramidal tracts. (Weigert stain.)

Examination of the pons and the oblongata does not reveal any noteworthy departures from normal. When we pass the motor decussation and get into the cervical cord there begin to be evidences of degeneration of some of the axis-cylinders of the pyramidal tracts. This becomes more apparent as we examine sections from lower levels in the cord. In none of the specimens is it conspicuously evident (Fig. 5), but there can be no question, I think, of the actual loss of neuraxons. There is comparatively slight increase of connective and neuroglia tissue, and the bloodvessels are not abnormal for an individual fifty years old. The pia is not thickened, the perivascular and pericellular spaces are well preserved, and, in short, aside from the degeneration just mentioned, the cord appears quite normal.

SUMMARY OF THE MACROSCOPICAL AND MICROSCOPICAL CHANGES. If we attempt to summarize the changes found in the central nervous system of this individual with hereditary chorea, we may say that they consist, macroscopically, of :

1. Thinness and atrophy of the cortex, evidenced by the diminution of weight, by the shallowness and breadth of the fissure, by the narrowness of the gyri, and by the thinness of the cortical mantle.

2. A mottled, tier-like, or streaked appearance and a cribriform state on cross-section of the brain in the fresh state. This streaked and cribriform appearance was due to a diminution in number and in size of the ganglion cells, particularly those of the deeper layers, to an increase in size of the perivascular and pericellular spaces, and to increased patency of the bloodvessels.

The changes determined by microscopical study may be summarized as follows :

1. A decay or slowly-progressive degeneration of the ganglion cells of the cortex throughout the brain, involving principally the layers of large pyramids and polymorphous cells, particularly evident in the Rolandic region, very much less so in the anterior pole of the brain, and incomparably less so in the posterior pole of the brain.

2. Increase of glia tissue, most marked in those sections that show greatest cell implication, but nowhere sufficiently prominent to constitute sclerosis. The increase of glia tissue, although rather universally distributed, is most conspicuous about bloodvessels and ganglion cells.

3. Enlargement of the pericellular spaces and distention of the perivascular spaces.

4. Slightly diseased bloodvessels, the principal change being a proliferation of the nuclei of the tunica externa and a thickening of the tunica intima. This implication of the vessels, which is neither regular nor symmetrical, is evidenced to a greater degree in one section than in another. No punctate hemorrhages were observed.

5. Relative paucity of the medullated constituents of the cortex.

6. Slight degeneration of the crossed pyramidal tracts of the spinal cord.

To summarize the microscopical finding in a few words, I may say that the lesion is a chronic parenchymatous degeneration of the cortex, principally of the Rolandic cortex, with consecutive and secondary changes in the interstices and vascular system.

ANATOMICAL FINDINGS CONTRASTED WITH THOSE OF SOME RECENT WRITERS. To bring these findings into contrast with those determined by Dana, by Oppenheim,¹ and by Clarke, I shall cite a summary of the microscopical examinations as given by these three authors. In Dana's

¹ Centralblatt für innere Medizin, 1894, p 918.

case the brunt of the process fell upon the central convolutions; they suffered first and most intensely. The process was not evenly distributed, but occurred in patches throughout the affected parts. There was nothing in the intricate nature of the process to justify the opinion that it is in any sense an inflammation. There was no proliferation of connective-tissue cells, no exudation, no accumulation of leucocytes about the bloodvessels, and only a slight amount about the nerve cells. The process corresponded in every respect to one of decay and degeneration, the nerve cell itself being the first that begins to die.

Oppenheim was led, from a careful study of two cases, one a man, aged seventy-five years, in whom the disease had lasted sixteen years, and another a woman, aged fifty-six years, in whom the disease had lasted but five years, to the statement that the essential morbid condition is a miliary, disseminated, cortical and subcortical encephalitis, eventuating in atrophy of the cortical mantle. The principal changes in the brain were narrowing of the gyri, broadening of the sulci, especially in the motor, parietal, and occipital regions, deficiency in number and size of the pyramidal cells constituting the layer of small pyramids, and minute foci of hemorrhagic infiltration in the subcortical layer.

Clarke sums up the morbid changes which he found in a case of this disease of unknown duration in the following words: "The morbid change consisted in a widespread, but partial degeneration of the cells of the cerebral cortex, especially the cells of the second and third layer, most-marked in the frontal and motor convolutions, together with an increased amount of interstitial tissue and number of neuroglia cells." He adds that there seems to be no doubt that the cerebral cortex, especially of the motor convolutions, is the seat of the disease, and that his own sections go to show that the primary lesion is a degeneration of the nerve cells, with a concomitant increase of neuroglia.

It seems unnecessary to dwell upon the fact that these observations are practically in accord in pointing that the disease is essentially of the parenchyma. The slightly discordant conditions found in these cases and in my own may be legitimately accounted for by a consideration of the ages of the patients and the duration of their symptoms. In Oppenheim's case alone were there punctate hemorrhages. This should cause no astonishment, when we recall that his first patient was a very senile individual who died of cerebral apoplexy, and that his second patient succumbed to an acute infectious disease, viz., influenza. In both instances the bloodvessels were enormously disposed to rupture, the first from the advanced age of the patient, and in the second because of the infection. No importance whatever should be attached to these hemorrhages, except that they were accidental. The minute vessels of the brain in the case that I studied were fittingly and quite prepared for rupture, and I have no doubt that this would have occurred if the

patient had lived sufficiently long, or if he had suffered from some acute disease, although naturally I hasten to remark that the occurrence of punctate hemorrhages, even under such auspices, would be by no means sure to follow.

Dana's findings I regard as of signal value, first because they duplicate in every respect those of my case, and second because they were found in the brain of a patient who had had the disease but a comparatively short time. The results of the microscopical study in both of these cases point unequivocally to the fact that the primary lesion is in the cell, and that the change in the cellular structure conditions not alone the phenomena of the disease, but the concomitant changes in the brain and spinal cord.

The most determined opposition to this view comes from Kronthal and Kalischer; but a careful examination of their writings on this subject convinces me that the contradictory evidence furnished by them is more apparent than real. They examined the central nervous system in a large number of cases of chronic chorea, and from their own experience, and from a consideration of the findings of others, they concluded that Huntington's chorea is in reality a diffuse, seldom circumscribed change of the brain cortex, consisting essentially of disease of the bloodvessels, which leads not infrequently through proliferation of nuclei and cellular hyperplasia to punctate hemorrhages and of proliferation of the glia and interstitial tissue. The nervous elements themselves are comparatively unaffected. Aside from the fact that the occurrence of such changes in Huntington's chorea is completely disproved by their absence in three of the most recent and most carefully studied cases of the disease (those of Dana, of Clarke, and myself), there are a number of arguments that may be brought forward to controvert this view. In the first place, and personally I consider this paramount to all others: it is not in accord with the tenets of pathology to consider together, except for purpose of contrast, or to attempt to parallelize the anatomical findings in cases of chronic Sydenham's chorea with those of Huntington's chorea. The first is an acute disease, in all probability dependent upon a specific cause, most likely an infection. The exciting factors, whatever they may be, exercise their pernicious activity upon the anterior half of the brain, and thus condition the symptoms of the disease. No doubt they may cause, if severe and continuous, real, definite, anatomical changes, and such changes may be demonstrated after death. But when the brain shows such a lesion all the tissues of the part are affected—the bloodvessels and the parenchyma, principally the former. When such conditions become chronic the characteristic lesion of a diffused or a circumscribed, hemorrhagic or non-hemorrhagic encephalitis ought to be found. Huntington's chorea, on the other hand, is a chronic disease from the beginning. If there is any one disease be-

yond being shelved with a pathogenic microbe, or with non-specific infection of any sort, this is the one. The most reliable evidence seems to me to point to the fact that it is a disease not dependent upon any cause acting through the bloodvessels or upon any change in the bloodvessels. This is in conformity with the admitted pathogenesis of the chronic degenerative nervous diseases. In every one of these diseases, without exception, there is some implication of the bloodvessels; but if disease of the bloodvessels were responsible for the occurrence of the degeneration in the parenchyma, then these disorders would needs be incomparably more frequent in association with disease of the arterial system than they really are. Nor do I believe that the increase of glia substance in any way points to the existence of a slowly developing vascular lesion as the primary condition. More than twenty years ago Weigert established the principle that diminished mutual resistance between tissues is followed by a process of proliferation of neuroglia cells, and the presence of abnormally developed glia tissue in the case such as I have reported indicates merely such perversion of resistance.

I am reluctant to say in so many words that Huntington's chorea is a disease dependent upon a slowly progressive decay of the parenchyma—the ganglion cells of the brain, more particularly of the anterior half of the brain, the Rolandic and the frontal regions—but the bulk of evidence bearing on this subject indicates so clearly that this is a fact that such a statement seems not alone warrantable, but is demanded. I wish particularly not to attach too much importance to any one terminal change or set of changes, such, for instance, as the change in the cells in this case. But when it is kept in mind that these abnormalities have been found by several observers in cases that terminated at very different stages of the disease, one is almost forced to the conclusion that this is the anatomical substratum of the disease.

A WORD CONCERNING THE GENESIS OF THE DISEASE. That Huntington's chorea is a disease conditioned by pre-natal factors, no one can deny. Yet I cannot, on this account, believe with Dr. Dana, that it belongs to teratology, using that word in the strict sense of its derivation and application. The fact that the germ plasm of the ancestry is freighted with the burden of death twenty or thirty years before the usual time does not warrant me in considering the disease either a congenital malformation or a monstrosity. It is highly probable that the proton of the ganglion cells may be properly formed, and, indeed, it does not seem to me likely that the cells of the Rolandic cortex if examined during the years of a patient's health would reveal any departures from the normal. In other words, it seems to me that we may infer a change in the germ plasm, a predisposition to early death, without a change in the germ cell. To express the nativity of Huntington's chorea more colloquially, it may be said that the ganglion cell

whose function it is to subserve motion and give basis to intellectuality is genetically lacking in the power which will enable it to exist as long under the same environment as the ordinary ganglion cell. This idea is in strictest conformity with Weismann's theory of heredity.

REMARKS ON TREATMENT. I should hesitate to allude to this sad phase of this subject did I not feel compelled to do so from a sense of duty. Not that I am able to suggest anything that may be of service, even in the amelioration of these unfortunates' conditions after the disease has developed ; but I desire to emphasize the laudability of endeavoring to delay the advent of the disease in those to whom it is a natural heritage, and to add my testimony to the utter futility and ridiculousness of tenotomy of the eye muscles, graduated, non-graduated, or any other kind, advocated by therapeutic pretenders. I am prompted to this remark by the fact that the most recent member of this family to show manifestations of the disease is now under the care of an individual whose understanding of the pathogeny of chronic degenerative nervous diseases of the convulsive order prompts him to the promise of a cure in such a patient as this. If one can look in the microscope at the sections from the Rolandic area of the cortex, such as those I have shown, and then state that such a condition can be overcome by any procedures directed toward the eye-muscles, he is a type of mind that surpasseth all understanding.

I shall take the liberty of making one therapeutic suggestion apart from those usually given in systematic writings on this disease, and shall preface it by saying that I do not forget the necessity of preventive, hygienic, and therapeutic measures of any kind that have in the past been shown to be of the slightest service in either delaying the disease or ameliorating its symptoms. The suggestion that I desire to make is this: All chronic nervous degenerative diseases, it matters not whether they be of the brain or spinal cord, be they convulsive or paralytic in manifestation, are benefited, if at all, by toxic substances given in toxic doses. We know not how they act ; we know only, as a matter of clinical experience, that to secure the efficacy of the bromides or of opium in epilepsy, it is necessary to give them in poisonous doses ; that strychnine may be of any service in progressive muscular atrophy, or that nitrate of silver should stay the process of locomotor ataxia, they must needs be given in doses to make their poisonous symptoms manifest. Ordinary medicinal doses of these drugs directed to the cure of the disease for which they have been mentioned are practically useless. Therefore it has occurred to me that if we wish to influence the course of hereditary chorea after it has once made its existence manifest, it is necessary to administer the elected substance, be it arsenic, opium, serum, or vital extract which it is hoped may be of service, in the largest possible doses consistent with life, and to maintain such administration for a prolonged time.

If experimental therapeutics would but teach us the changes that go on in ganglion cells as the result of administration of such poisons, revealable by the methylene-blue method, we would be started on the road to the discovery of some measure for the radical cure and treatment of many diseases now treated empirically. Such studies have already been begun, and no one can allow his thoughts to dwell upon the morbid anatomy of chronic nervous diseases without indulging the hope that they may be continued.

Although the physician is not a deputized nor a self-constituted monitor of society, nor should he even have a desire so to be, nevertheless he may legitimately indulge himself in following the dictates of altruistic sentiments for society's welfare. In the opinion of the present writer he cannot more wholesomely or adequately give voice to an expression of these aims than by using such influence as he may possess against marriage for those whose heritage is such a disease as Huntington's chorea, and who, in case progeny be vouchsafed them, will undoubtedly propagate it, no matter how supremely vital the germ plasm of the other parent may be.

TRAUMATIC NERVOUS AFFECTIONS.

A STUDY OF TEN CASES.

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IN attempting to study ten cases of nervous affections following violent injuries, only the more salient features of their histories will be given. The literature of this subject, which is now very voluminous, has been so recently gone over by several writers¹ that I will refrain from any similar effort in this paper.

As is well known, not only vague, fleeting, and indefinite nervous symptoms follow and result from traumatisms, but many definite nervous affections as well. On the face of the subject, it would seem absurd to suppose that any violent general shake-up of the body would produce one particular nervous affection; for, in general, we know that traumatisms, like other existing causes of disease, produce various affections depending upon the predisposition and temperament of the individual. Of a number of persons subjected to what seems to be the same sort of traumatism, some may suffer from severe nervous symptoms while others may escape such sequelæ. This, again, is to be explained

¹ Dana (Hamilton's System of Legal Medicine, p. 297) and Knapp (Nervous Diseases, by American authors, p. 135).

on the theory of difference in predisposition and resisting powers, although it is well to bear in mind that it is exceedingly difficult to say of any two cases that the trauma was of equal or approximately equal severity. In view of these facts it would seem unlikely that violent traumata would set up a particular sort of nervous affection, a disease entity, to which a specific name, such as "railroad spine," "traumatic neurosis," or "spinal concussion," could be applied; but it must be admitted that certain of the nervous symptoms following these violent injuries are much the same. It is this fact, indeed, that has led many to describe these affections as though they belonged to a single disease entity. But the pathology is obscure, and, no doubt, varies greatly. Post-mortem records are scant, indeed. To be sure, such lesions as hemorrhage and lacerations have been found, and symptoms arising from these are fairly well recognized, but of cases with a vague and indefinite symptomatology, the pathology may be said to be practically unknown. For this reason it is not logical to say, as some have, that all these nervous cases get well; no more than the same could be said of hysteria or neurasthenia. The cases to be studied in this paper will be considered from the clinical and medico-legal aspects, for I have no autopsies to offer. In eight of these cases damages were claimed, while in the two remaining cases, in which no such claims were made, the symptoms were more severe and persistent than in some of the other cases. Although damage claims were settled in one of these cases some months ago, no improvement followed.

These ten cases may then, from a medico-legal point of view, be divided into two groups, the first of which will comprise eight cases in which damages were claimed, and the second group two cases in which no damages were claimed. The question of the genuineness of the subjective symptoms in these nervous affections following violent accidents has long been a bone of contention, and although it has been very generally admitted that the element of exaggeration plays an important rôle in many of them, there are to-day only a few neurologists who contend that simulation enters into them largely. I know of no method of clinical study which is so well calculated to throw light on these mooted points of exaggeration and simulation in this class of cases as such a comparison between litigation and non-litigation cases; and while the cases to be reported will be considered with respect to this point chiefly, yet there are certain points relating to symptomatology, prognosis, and treatment which will also be considered.

Seven of these eight cases comprising the group of litigation cases received their injuries through an explosion of natural gas, which occurred February 27, 1895. The seven persons injured in this accident were all at work in a cigar-factory when the explosion occurred. The building was greatly damaged, and most of the seven persons who

afterward claimed damages received surgical injuries concerning which there was no controversy. These seven cases will be first related.

They were all examined by Dr. J. P. Shaw and myself in March, 1896, a little more than a year after the accident. But Case I. had also been examined by us previously—on May 29, 1895. To describe this first examination of Case I., I will draw from the notes and report Dr. Shaw and I made at that time :

CASE I.—Man, aged thirty-seven years. *Personal history* (as given by litigant and his physicians). He has been married eight years, and is by occupation a cigarmaker. He has always enjoyed good health, and has worked uninterruptedly at his trade (cigarmaking) for the past fourteen years, save for an attack of typhoid fever, from which he suffered thirteen years ago, and from which he fully recovered. His weight for the past ten years has ranged from 135 to 145 pounds, generally staying at about 139 pounds. Since the accident to be described he has been run down in flesh, and now weighs 123 pounds. On February 27, 1895, while at work in the second story of the cigar-shop, a gas explosion occurred which projected him up in the air from the table at which he was at work. He alighted face downward, striking the left testicle in doing so. He was unconscious for a few moments. Returning to consciousness, he immediately arose and knocked out a window, and went around on the outside of the window-sill to another window, and there assisted from the building some girls employed in the factory. He then got his coat, and, ten or fifteen minutes later, proceeded to the office of his physician. About this time he noticed that he was bleeding about the mouth, and that the canine and first bicuspid teeth of the right upper jaw were missing. Immediately after the accident he noticed swelling and pain in the left testicle. He noted also a large black-and-blue mark in the left groin. He experienced nausea and vomited. Upon retiring that night he noticed that the swelling in the testicle had increased; he also noted slight tenderness over right parietal region, just to the right of median line, but paid no attention to it, and stated to us it did not amount to anything; the left testicle continued to swell through the two following days, when it had attained its height, and remained so swollen for another week, when it began to subside, and has continued to do so up to the present time (May 29, 1895). Three days after the accident he took the position of watchman about the building in which the explosion had occurred, and continued in this capacity for two weeks, suffering all the while from some pain arising from the swollen left testicle, and at times from nausea, but complaining of no other trouble. After acting as watchman for two weeks, he was one day seized with weakness and pain in his head (in median line, three inches anterior to the occipital protuberance), and walked home without assistance, and told his wife he was sick. From this time his mind was a blank for a week and a half, at the end of which period he returned to consciousness to find he had lost some power in the left side of the body. His physician states that during the period he was unconscious urine dribbled away from him, latterly most of the time, being tinged with blood. This hæmaturia continued until May 27, 1895, or two days before this examination. The return to consciousness was gradual, taking place in two days.

Examination. May 20, 1895. The litigant is five feet six inches tall, thin, emaciated. In walking he distinctly drags the right leg. His right arm hangs rather limp at his side. He complains of pain along a line running from median line of head about three inches anterior to the occipital protuberance down to end of lower lumbar spine, and also of pain over the entire right side of the trunk, especially over the summit of the shoulder. This pain he states is present night and day. Moderately firm pressure over the spinous processes, he said, caused pain, which was excessive over the seventh dorsal, and at a spot over the dorso-lumbar junction. He states that the entire side of his body was insensible to pain. We tested this by pinching, and by plunging needles into the skin at various points over this region and by applying a very strong faradic current. Both these procedures, he stated, were painless. Deep pressure over the right side caused pain, especially over the upper portion of the right trunk. Tactile sense was, as shown by his answers, greatly diminished over the entire right side. It was noted in testing that deep pricks with the needle brought no blood, and that the gaping cavity produced by the pricks seemed wax-like. The muscular power of his right leg and arm was apparently diminished. With the dynamometer the grasp of the right hand showed eight pounds; tests with the galvanic and faradic currents showed the presence of neither quantitative nor qualitative changes in muscular responses.

The left shoulder was distinctly higher than the right. There was some slight scoliosis in the dorsal region (to the left). The penis and testicles appeared normal. There was a slight abrasion over the left pubic region (probably caused by bandage). Deep pressure over the left perineal region, he said, caused great pain.

Abdominal and cremaster reflexes both active. Knee-jerks: right, present but diminished; left, present, normal or slightly exaggerated.

Fields of vision: Right, greatly contracted; left is also distinctly contracted (both for white).

Pupils react to light and accommodation.

Urine: specific gravity, 1020; acid; no albumin; no sugar. Microscope shows oxalate of lime crystals and amorphous phosphates. No blood, pus, or epithelial cells.

COMMENTS. His thin, emaciated appearance would impress any one that he is ill. His manner and general bearing lead us to believe that he is honest in his various assertions. We detected no efforts at malin-gering or concealment. That the accident caused Mr. H. to lose two teeth and to injure his left testicle so that it became swollen and inflamed, we assume can be taken for granted. The hæmaturia may have been caused by some injury to the prostate or deep urethra or bladder, but it would seem that whatever damage the testicle and urinary apparatus may have sustained has now been largely repaired. There remain for consideration the symptoms of coma, pain, general weakness, emaciation, hemianæsthesia, and hemiplegia. These demand serious consideration. We are of the opinion that these symptoms are very largely or wholly produced by the nervous state of the litigant, which we believe to be one representing an admixture of neurasthenia (nervous exhaus-

tion) and hysteria. The reasons favoring this view are twofold, viz., negative and positive. The appearance of hemiplegia *some days after this accident* and its mode of onset are against organic disease being the cause of it. It is well known that hemiplegia is almost invariably of cerebral origin. Spinal lesions are very generally the cause of paraplegia. In Mr. H.'s case, the history of head injury to account for this hemiplegia is entirely wanting. If a gross spinal lesion were present he would, in all probability, if paralyzed at all, be symmetrically paralyzed. On the other hand, partial right hemiplegia, with complete anæsthesia of the paralyzed side, and great loss of tactile sense without facial paralysis, without aphasia; the spinal tenderness, with two points of especial tenderness (hysterogenic points); the markedly contracted visual fields; the failure of blood to follow needle pricks, and the gaping cavities left by the same, all very strongly point to the right-sided paralysis and loss of sensation as being of hysterical origin. Spinal tenderness is often seen in cases of neurasthenia. The man's generally weakened condition may most probably be attributed to nervous exhaustion.

Medical literature shows that hysteria and neurasthenia frequently follow such accidents as the one from which Mr. H. suffered, and it is, moreover, well known that fright is one of the chief causes of hysteria. Following the accident there was, very likely, prostration, relaxation, and irritability of the nervous system, and this constitutes the neurasthenic element in the case.

In March, 1896, ten months after the above examination and report were made, Dr. Shaw and I again examined Mr. H. We noted that he walked better, although his gait was different from that observed at our first examination; he walked now by raising up the entire left side through the action of his trunk and pelvic muscles. The pain in the perineum was less; the knee-jerks were unchanged. His weight was ten pounds less than at the time of our first examination; the right-sided anæsthesia, involving conjunctiva and buccal mucous membrane, was still absolute. The spots of spinal tenderness remained; there was no atrophy. He stated that he was able to only partially open his mouth, and that he had been troubled in this way for the past six or seven months. At short intervals he closes his eyes firmly. He stated that his appetite was good and that he slept well. On the whole, there was little change noted at this examination.

REMARKS. What has been already said as to the nature and genuineness of the symptoms in this case needed, in my opinion, no alteration after this second examination. That the partial hemiplegia following a coma which came on seventeen days after the accident, absolute hemianæsthesia, spinal tenderness, and restriction of the visual fields could be simulated, I regard as so highly improbable that the supposition is, in my opinion, preposterous. The prognosis at our second examination

seemed more grave than at our first examination. Damage claims had not yet been adjusted.

CASE II.—A girl, aged twenty-four years. She received a number of bruises and was very nervous and excited after the explosion. A lump the size of the fist raised on the back of her head. The swelling and bruises disappeared in the course of a month, during which time she was confined to bed. Since the accident and up to the present time she has complained of almost constant pain in the back and neck, and has been subject to frequent headaches. She states that she has less strength and that her power of endurance is greatly lessened. There is marked tenderness on pressure over fifth, sixth, and seventh thoracic vertebræ. She states that for three or four months following the accident she slept poorly, but that she has since slept well. Her general appearance is excellent.

REMARKS. The nervous symptoms of this case were entirely subjective. But we believed they were genuine, (1) because we learned that they were constantly complained of, (2) because they are symptoms ordinarily seen in neurasthenia, and (3) because it seems to us highly improbable that such a train of symptoms could be simulated, and for so long a time.

CASE III.—D., girl, aged twenty-one years. Her conjunctivæ were inflamed after the explosion. For three weeks following it she had frequent, violent laughing spells. Ever since the accident she states that she has slept poorly. Frequently she awakens in the night, and often has terrifying dreams. Her strength and endurance have been much less since the accident. She has headache almost constantly. There are points of tenderness over the first, sixth, and tenth thoracic spinous processes and at lumbo-sacral junction. There is a small spot of anæsthesia about the size of the palm of the hand over the left posterior thoracic region. There is great contraction of both visual fields.

REMARKS. This case we took to be one of hysteria with some element of neurasthenia. Malingering again seemed out of the question, for we believed it wholly improbable that an unsophisticated girl could simulate contracted visual fields, spinal tenderness, and segmental anæsthesia—stigmata of hysteria.

CASE IV.—L., man, aged thirty-seven years, enjoyed good health before the explosion. He was slightly burned about the face and greatly shocked, but at once began to assist the girls out of the building. He thought at first he would not be troubled in any way except by the slight burns. He complained that he was afterward troubled a great deal by nervousness, but he could not describe in anything like a definite manner in what this (nervousness) consisted. The chief burden of his complaint was concerning his eyes. He stated that since the accident he has been greatly troubled in reading, could read only a few minutes before becoming so fatigued that he is compelled to rest his eyes. The oculist who attended him testified at the trial that Mr. L. suffered from an error of refraction in each eye, and that aside from this

they presented nothing abnormal. He resumed work ten days after the accident, and has continued at it up to the present.

REMARKS. The symptoms of general nervousness and difficulty in reading were described by Mr. L. in such a vague and indefinite manner that we concluded they were largely or wholly simulated, and the oculist's declaration that errors of refraction existed in the eyes which could in no way have been caused by the accident only confirms this opinion. The very healthy appearance of Mr. L. at the time of our examination, and the fact that he has worked steadily since the explosion, also favored this view.

CASE V.—Man, aged forty-four years. He suffered severe burns about the scalp and face which were much swollen. These burns were much better at the end of three weeks. He did not work until three months after the accident. He tried, but failed. At times he has a good deal of headache. Sleep is restless, appetite poor; weight 123 pounds. He has a sense of being tired. He describes in a vague way certain confusion to which he is subject in the midst of his work.

REMARKS. There is no question as to the burns; the nervous symptoms were purely subjective, and while, possibly, they had some foundation in reality, they are probably a good deal exaggerated, and were not even, as described by the claimant, very severe.

CASE VI.—Girl, aged twenty-two years. She was in a highly emotional and excited condition immediately following the explosion. The next day her physician who called upon her found some elevation of temperature, and the following day some right ovarian tenderness. He thought there was inflammation in the right pelvis. She remained in bed three or four weeks. She worked for a short time, but in June, 1895, she was again taken down in bed with nervous dyspepsia and severe (crapulous) diarrhœa. Her physician attended her two weeks at this time. Her sleep has been greatly disturbed; she frequently awakens screaming. She suffers greatly from lack of energy and endurance, and has a tired, dragged-out feeling. Her mother (who was with her) states that the girl has changed greatly in disposition; that she is morose, depressed in spirits, and easily irritated by noises. The girl states that she frequently has most distressing dreams about the accident. She was evidently very nervous during our examination. She states that the right ovarian tenderness persists and troubles her a great deal. She worked from September, 1895, up to the present time, but in much distress.

REMARKS. There was in this case, apparently, some ovarian inflammation, and perhaps pelvic, too. Doubtless there was a severe shock to her nervous system, and considerable nervous irritability and prostration (even allowing for exaggeration) have resulted. The genuineness of the symptoms in this case can scarcely be doubted, for we should have to suppose too much if the theory of malingering were adopted. The symptoms suggest a condition representing an admixture of neurasthenia and hysteria.

CASE VII.—A., girl, aged eighteen years. She received a severe burn on the left forearm, involving one-third of its circumference, and extending from the elbow to the wrist. She complained of no nervous symptoms.

REMARKS. The negative observation that this girl, although having received a severe burn, suffered from no nervous symptoms is of interest, for it is quite likely that she received as severe a shaking-up as some of the others in the building and who afterward complained of nervous symptoms.

GENERAL REMARKS ON THE ABOVE-RELATED CASES. Soon after the explosion damages were claimed in all these seven cases, and while some of the claimants suffered surgical injuries, the symptoms on which they rested their claims chiefly were those of a nervous character, except in Case VII., in which no nervous symptoms were complained of; and yet, curiously enough, this very claimant suffered the most severe surgical injury of any of these seven cases. These suits for damages were tried in March, 1896, more than a year after the explosion. During this interval the different claimants saw each other, visited the scene of the disaster, and talked over their injuries and the pending damage claims. Each claimant returned to work at the old shop after it had been repaired and as soon as he or she felt able. Mr. H. (Case I.), as has already been stated, assumed the position of watchman about the old shop three days after the accident, and continued in this position for two weeks, when the coma, which was followed by hemiplegia, supervened. Mr. H. also heard his physician testify at the trial that he could never get well, that his trouble was incurable, and that he would go from bad to worse.

Let us now briefly examine these psychical factors which were at work in these cases. In the first place, the explosion itself, no doubt, produced a very great psychical shock in each of these cases; and the association of the claimants with each other, their frequent visitations to the scene of disaster, their conversation with friends, attorneys, and physicians, and, lastly, the excitement incident to a lawsuit which they looked forward to for months; the hearing of more or less gloomy prognoses of their cases in court, constituted a most powerful series of psychical factors which were in the highest degree calculated to maintain and exaggerate neurasthenic and hysterical symptoms, or, indeed, set them up and retard progress toward recovery of individuals suffering from any affection. Surely, if there is anything at all in harmful mental suggestions, they are well illustrated in these cases. How far removed from ideal psychical conditions were those surrounding these unfortunate claimants!

In Cases IV. and V. we believed that there was very little basis of reality in the symptoms complained of, yet I would not like to say that

either of these claimants was a malingerer pure and simple. Each had received a tremendous shock and a surgical injury, and felt aggrieved at those responsible for them. Then the association and conversation with the other claimants probably led to a great deal of introspection or self-argument, the result being that each convinced himself that he had some nervous symptom much after the fashion that some persons argue themselves into certain feelings or opinions they wish to possess; *e. g.*, old fishermen and soldiers, etc., it is well known, often believe their own lies after they have told them a great many times. But in these two cases the ideas which gave rise to their symptoms were so feebly impressed on the consciousness that the symptoms themselves were vague, indefinite, and I had little doubt would disappear after the settlement of the damage claims.

The next case to be described was also a litigation case.

CASE VIII.—Man, aged fifty-four years, married, machinist. He was working at his trade, and in excellent health, when the accident about to be described occurred.

On April 1, 1895, he was struck by a "live" electric wire on the hypothenar eminence of the left hand, sustaining a shock which rendered him temporarily unconscious. When he recovered consciousness he felt numb and stiff all over his body. The next day he tried to work, but the day following he quit work on account of this feeling of being "numb and stiff." By the second day his hand had greatly swollen, and still more by the third day. A few days later the swelling subsided, leaving a small cicatrix. On the third day after the accident he experienced severe pains all over his body. His daughter states that after the accident she noted the metallic fastening of his suspenders had burned an imprint upon his back. Ever since the accident he has been daily subject to severe shooting pains along the spine and down the legs, and to a less degree in the arms. These pains often last several hours at a time. He states that he has lost his "snap" and energy, and that his power of endurance is greatly lessened; that his sleep is greatly disturbed, whereas formerly he always slept well. His wife states that since the accident he has become cranky and irritable, and is easily annoyed by trifles; that while it was formerly very easy to get along with him at home, this has, since the accident, become a very difficult matter, owing to this marked change in his disposition. She further states that he has lost all of his cheerfulness and is greatly discouraged; that whereas it has been his custom to indulge in sexual intercourse once a week, he has not attempted to have connection since the accident. His appetite is poor.

The first examination was made about three months after the accident. The man had a worried, distressed look, and, during the examination, broke into tears. His weight was 160 pounds (claims that before the accident he weighed 182 pounds). There was a tremulousness about the face and a tremor in his hands. Stripped, he exhibited no atrophy. There were no quantitative or qualitative electrical changes. Dynamometer: right, 60; left, 80. Both knee-jerks were feeble. Pin-pricks were not felt in the left leg or thigh, and tactile sense is somewhat

diminished over the member. He stated that there was numbness in this leg. There was no other sensory disturbance. There was marked tenderness on pressure over the spinous processes from the ninth thoracic downward. On the several occasions upon which I saw this man the burden of his complaint was always the same.

In the spring of 1896, one year after the accident, he accepted \$900 in settlement of his claims for damages. I saw him in May, 1897, about thirteen months after this settlement, and noted no change in his appearance. He told me that the severe shooting pains, loss of endurance and sexual power, depression of spirits, and other subjective symptoms continued, and that he was still unable to resume work.

REMARKS. The only objective signs in this case were diminished knee-jerk, tremors, and the loss of pain-sense in the left leg (if this latter can be called an objective symptom). Yet the man's way of telling his story and his consistency in repeating it, his general appearance, and the corroboration part of his story received from his wife and daughter convinced me of the reality of his symptoms. Moreover, if the position were taken that the man was a malingerer, one would have to suppose that he was most skilfully acting a part, a thing I believed a man of his intelligence incapable of doing, even if he so desired. Finally, the symptoms from which this man complained are those we see as expressions of an exhausted and irritable nervous system, and I look upon his case as one of severe neurasthenia. The persistence of his symptoms thirteen months after the adjustment of his damage claims strongly bears out the views I have above expressed, and affords a strong argument against those who contend that cases like this, with scanty objective symptoms, are pure cases of simulation, and get well as soon as they have received damages.

The next case was the subject of a study by Dr. F. H. Edsall and myself,¹ on account of a most interesting condition of partial ophthalmoplegia which it presented, and which appeared to us to throw considerable light on the question of localization in the third nerve nucleus. For a description of these cases I quote from this publication.²

CASE IX.—H. T., aged fifty-two years; blacksmith; denies syphilis. He was in robust health and working regularly at the time he met with the accident about to be described, and to which he attributes all the symptoms from which he now suffers.

Four years ago he fell into a pit eight feet deep, sustaining a fracture of a rib and a number of bruises. He was not rendered unconscious by the fall, but states that he was very much "shaken up" by it, and was in a dazed condition for some time afterward.

The next day after the accident he made an effort to work, but found he was too stiff and sore to do so, and gave up the attempt. He states that he has from that day suffered from the symptoms from which he now complains, except that the pain from the broken rib and bruises soon disappeared.

¹ *Annals of Ophthalmology and Otology*, v., No. 2, April, 1896.

² *Op. cit.*

Present condition. Short, stout, thick-set man. He walks with feet wide apart, taking short steps, carrying head well thrown back. (See the accompanying photograph.) The scleræ are seen between the upper lids and superior margins of the cornea. His speech is slow, measured, sometimes halting. (This symptom, too, appeared since the accident.) He complains of pain in the occipital region and along the entire spine. Muscular strength and power of endurance are greatly diminished. His finger movements are weak and clumsy, so that he finds it very difficult to button or unbutton his coat. The knee-jerks are normal. There are several points along the spine pressure over which causes much pain. There is bilateral superior rectus palsy



(almost complete), which accounts for the backward tilt of the head. While the internal recti act in a conjugate deviation of the eyes, they act little if at all in convergence. Marked (almost complete) palsy of the iris and ciliary muscles is present. The eye-grounds reveal no striking changes.

A recent examination, made in December, 1897, showed that the ophthalmoplegia had progressed. The inferior recti were almost totally paralyzed. Conjugate movement to the right and left was still preserved, but markedly weakened.

The peculiar gait, the stiffness and clumsiness of movement, and the occipital and spinal pains were still present, causing him great discomfort. The right leg and arm now showed marked spasticity and considerable loss of power.

REMARKS. We have in this case progressive ophthalmoplegia and a most marked series of objective symptoms. To be sure, there is a possi-

bility that, after all, they may not have been brought about by the accident, and that their occurrence after it may have been merely a coincidence. Two points argue against this, viz.: (1) the statement of the man that very soon after the accident he began to hold his head tilted backward; and (2) the subsequent appearance of right-sided paresis and spasticity. All his other symptoms are subjective, and if the view be accepted that the eye symptoms resulted from the injury we have a most powerful argument for the genuineness of the subjective nervous symptoms. Then, too, it must be remembered that this was not a litigation case; and this fact, the man's age (forty-eight years at the time of the accident), and the apparently entire absence of a neuro-pathic temperament are further arguments in favor of this view. The foregoing considerations lead me to believe that both the eye and the general nervous symptoms resulted from the injury the man received almost five years ago. However the ocular palsies originated, whether through molecular death, or hemorrhages, or inflammation in the third nerve nuclei, *progressive degeneration of these nuclei has gone on since the accident*. Actual organic changes, then, being almost certainly at the bottom of the ocular palsies, and partial spastic hemiplegia having developed, it is altogether reasonable to suppose that the general nervous symptoms are to be accounted for by organic molecular changes in the finer nerve elements, and changes, demonstrable, too, by the aid of the microscope. In a case which presented very severe nervous symptoms following a traumatism, and in which the central nervous system was examined after death by Dr. F. X. Dercum,¹ no changes were noted. But the criticism was made by Collins² and others that the nerve-staining method of Nissl, had it been employed in this examination, might have shown changes.

From a clinical point of view, this case is difficult to classify. It is certainly not one of the hysteria, and to call it neurasthenia, even in part, seems like begging the question. It differs greatly, even aside from the eye symptoms, from any other case in the series. Widespread progressive degenerative changes in this man's central nervous system must be going on.

CASE X.—A. C., aged twenty-one years, single, grocer; his father is rheumatic, and his mother has "nervous debility;" he worked regularly, and was always in good health except for occasional attacks of quinsy.

September 2, 1894, while sitting on a railing, he was, with a number of companions, precipitated backward fifteen feet to the street below, because of a sudden break of the rail. All saved themselves except the patient, who fell, striking a rock projecting from the wall, at the small of the back, alighting on hands and knees. A number of superficial bruises resulted. He arose at once to assist a companion who had sus-

¹ Transactions of American Neurological Association for 1895.

² Op. cit.

tained a fracture of the knee-cap, and in whose welfare he became much concerned. During the two or three days following the accident he noticed nothing wrong. At the end of this time he began to stagger. This symptom increased steadily up to November, 1894.

The staggering was always worse after exertion, and almost disappeared after rest. Upon rising in the morning after a night's sleep he would not stagger at all. Toward evening (after exertion) the staggering would be very exaggerated, so that he was often unable to walk alone. Exactly at the time staggering began numbness appeared over the whole left side, including face, and increased, accompanied with motor palsy, on the same side. During this time he was eating heartily and sleeping very well, but says he went to closet seldom: occasionally a week would elapse between his visits. Often he could scarcely control bowels; when desire for stool came he was compelled to go very quickly. On several occasions he met with accidents, being unable to get to closet in time to save himself from disgrace. This bowel trouble lasted until the spring of 1895. In the middle of November, 1894, the numbness and loss of power on the left side were very marked, but with difficulty he could, after rest, walk a couple of squares. At this time he saw a physician, and while under treatment the numbness disappeared from the left side overnight, while asleep, only to appear in the right side, which was involved exactly as the left side had been, if anything, in a more severe degree when he awoke in the morning. This he attributed to the medicine he had been taking.

From this time he made slow and satisfactory progress until the spring of 1895, when the anæsthesia and palsy as well as the staggering had grown less—indeed, almost disappeared. For the next nine months his condition varied little. I saw him for the first time in January, 1896. At that time the chief burden of his complaint was the loss of power of endurance. He had a strong grip in either hand, but there was a certain clumsiness in the fingers of the right hand which prevented him from executing delicate movements with the same facility as formerly. In walking he gives the right leg a distinct swing. He states that he felt a distinct clumsiness in his leg, and believed that he was not nearly as strong in the right as in the left side. No contraction of visual fields; knee-jerks increased. When seen a month later he complained of stiffness and soreness in his leg, and said that the skin over his abdomen felt an inch thick.

On February 15th he started to run a laundry wagon, but gave up this occupation at the end of three days on account of a great increase of weakness in his legs (equal in both).

After March, 1896, he was lost sight of until January, 1897, when he reported that his condition was unchanged; that fearing his legs would give out he had not again attempted to go to work.

REMARKS. There was no damage claim in this case, but if there had been, no doubt, since the symptoms were purely subjective, they would have been stoutly contested. So, in the absence of motive for simulation, it can be fairly assumed that this man is not a malingerer, for he has nothing to gain and much to lose by acting a part.

From a clinical point of view, the bizarre make-up of the symptom-complex, its shifting character, the hemianæsthesia with hemiplegia,

with the remarkable transference from one side overnight, are enough upon which to make a diagnosis of grand hysteria.

GENERAL REMARKS ON THE FOREGOING CASES. In considering now some lessons taught by these cases, one (VII.) may be eliminated from consideration, as it is not a nervous case at all, but has been introduced in this place for its negative value, viz., as an illustration of how an individual may receive severe physical injuries and escape entirely nervous symptoms through the same accident which will leave many complaining of severe nervous symptoms. Of the nine cases left for consideration, seven were litigation cases, two were not. Two of the seven cases I believe to be malingerers, or rather, instances of individuals who had by argument with themselves persuaded themselves of the presence of certain symptoms which had slight, if any, reality.

The remaining five of this litigation group I believed to be real sufferers, although the symptoms complained of were, for the most part, subjective. Exaggeration of symptoms, I believe, was made in most of these cases. It was made in Case X., which was not a litigation case, and I may add that it was so commonly seen in hysterical and neurasthenic patients with no "claims" that it ought, indeed, to make one hesitate in branding an individual as an impostor in whom it is observed. To demand that the objective symptoms alone be considered in examining these litigation cases is, to my mind, manifestly unfair; for certainly no one would maintain that the same rule be applied to the physicians examining ordinary patients. Most difficult, indeed, the problem is at times, but this short-cut way of disposing of it will not do in the face of the facts, well known to every physician, that subjective symptoms are often the most real, most severe, and most persistent of symptoms, and that frequently no objective symptoms, or only slight ones, accompany them.

To determine the value, then, of any set of subjective symptoms physicians should study most carefully *the manner in which they are related*, whether as a whole they fit into the description of any known disease or diseased condition. If they do so, the probabilities are very strongly in favor of their genuineness. Objective symptoms, even when they are few and minor in character, are of great importance in sustaining this view. Now, supposing that symptoms do present themselves in a group so that, ordinarily in a non-litigation case, we should say that they were hysterical or neurasthenic, or both, is it not plain that in the litigation case we should say the same of them? Those who demand that these subjective symptoms be thrown out, because they may be simulated, suppose the individual who presents them to possess consummate skill. For to me it seems that the feigning of a long train of neurasthenic or hysterical symptoms would show, on the part of the simulator, a fine knowledge of these symptoms and splendid powers of

acting—suppositions which could be entertained in only very exceptional cases. The successful simulation of nervous symptoms would require, beside this knowledge and skill, a degree of attention well-nigh impossible.

I have several times asked persons in good health who were strong believers in the "simulation theory," how they would go about it to illustrate in their own persons their contention that simulation was easy, and I have never found one who had more than the haziest of ideas on the matter.

It was then by taking into account the manner in which symptoms were described, the symptoms themselves, and the fact that, for the most part, they were those common enough to neurasthenia and hysteria, and the fact that an adequate cause for them existed, that I was led to believe that five out of these seven litigation cases were genuine sufferers such as they (in more or less exaggerated manner) described themselves to be. Two cases (IV. and V.) I believed to be malingerers because of the manner and vagueness of their descriptions of their symptoms. Cases IX. and X. are strong arguments in favor of the position I have taken in this paper. Had they been litigation cases, probably both would have been called malingerers by some of the astute examining surgeons, who, as matters are, would be content to grant them all the symptoms they claim.

The symptoms from which these two unfortunate men suffered drag along year after year, in Case IX. becoming worse, although it is in both cases clearly against the interest of the men to have them do so. In Case VIII., although his damage claims were settled over a year ago for \$900, he continues to complain of the same symptoms which bothered him before the settlement. I regret that I am unable to state the effect settlement has had on the other cases.

From a clinical point of view these cases are, I believe, for the most part, properly designated neurasthenia or hysteria, since they present symptoms commonly seen in one or the other of these affections or both of them. Cases I. and X. appear to be excellent examples of major hysteria.

In certain of these cases (VI. and IX.), however, something more than, *or other than*, hysteria or neurasthenia exists. Certainly the progressive degeneration of the third-nerve nucleus and spastic hemiplegia are symptoms of neither affection. To explain this case and, perhaps, Cases VI. and VIII., one is tempted to adopt the views of Schmauss,¹ Leyden, Obersteiner, and Bikeles, who hold that death of nerve-substance may be produced by shocks without antecedent hemorrhage or inflammation. This theory would indeed better account for the general nervous symp-

¹ Centralblatt für Nervenheilkunde, August, 1894.

toms, aside from the progressive ophthalmoplegia seen in Case IX., than the hemorrhage or inflammation theories. The same would be true of Cases VI. and VIII. There are in this series far too few cases upon which to base any broad conclusions as to prognosis. But with two non-litigation cases (IX. and X.) going on several years without improvement, but, on the other hand, in Case IX. progressive deterioration taking place, and with another, Case VIII., complaining of all his old symptoms six months after the settlement of his damage claims, we have an ample refutation of the views that these nervous affections do not occur where there is no question as to damages and that prompt recovery always follows the settlement of damage claims. These three cases, however, I believe are to be regarded as unusually grave and offering exceptionally unfavorable prognoses. The same can be said of Case I. All the other cases at the time Dr. Shaw and I examined them stated that more or less improvement had occurred.

CONCLUSIONS. 1. Nervous symptoms complained of as following severe accident are, while often exaggerated, usually very real.

2. Simulation is rare and easily detected by the skilled neurologist.

3. To successfully simulate nervous symptoms is a difficult task, possible to only a few.

4. The symptoms in any case may be subjective wholly or chiefly.

5. The nervous symptoms set up are, as a rule, neurasthenic or hysterical, or both.

6. A certain number of cases suffer from symptoms not attributable to either of the above conditions.

7. An actual degeneration of the nerve-substance is sometimes set up, and may progress.

8. While there is a strong tendency to recovery in many of these cases, the prognosis, in not a few cases, is grave, and in still others quite hopeless.

9. While the physical element in most of these cases is powerful, there are others in which it plays a very minor rôle.

10. Any name used to describe these nervous affections carrying the idea that they constitute a morbid entity is undesirable.

11. Some name, *e.g.*, "traumatic neuroses," if used to mean any nervous affection following a traumatism, would be useful.

A CONTRIBUTION TO THE STUDY OF THE MUSCULAR DYSTROPHIES.

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For a long time it was supposed that progressive muscular atrophy, as first systematically described by Aran in 1850, was a disease of uniform pathology, resulting from degeneration of the ganglion-cells in the anterior horns of the spinal cord. Later studies, however, have shown that such atrophy may result also in the absence of appreciable lesion of the spinal cord or of the motor nerves representing the peripheral continuation of the anterior ganglion-cells of the spinal gray matter. In explanation of the cases included in the second group it is assumed that the disease originates in the muscles themselves, constituting the so-called myopathies, in contradistinction to the cases of spinal origin, or myelopathies. In some cases, further, it had been observed that with motor weakness there was associated increase rather than diminution in the size of the muscles functionally concerned. To Erb,¹ in especial, belongs the credit of having pointed out that in both the cases with wasting and those with apparent hypertrophy the essential demonstrable lesion is the same, viz., increase in size of some muscular fibres, with diminution in size of others, and degenerative changes; and more or less increase in the interstitial connective and fatty tissues. Erb is, however, not entirely willing to admit that the changes in the muscles are purely myopathic, contending that they may depend upon impalpable nutritional alterations in the ganglion-cells of the anterior horns of the spinal cord not capable of demonstration with our present resources. He, therefore, proposes to designate this group of cases as muscular dystrophies, thus not committing one definitely to a theory of their pathology. Several types of the disease have been described, as, for instance, the idiopathic, the pseudo-hypertrophic, the juvenile or scapulo-humeral of Erb, the infantile of Duchenne, or the facio-scapulo-humeral of Landouzy-Déjérine, and the hereditary of Leyden; but it is doubtful if any useful purpose is subserved by this classification, inasmuch as the boundaries of the several so-called types are ill-defined, and many if not most cases present features of two or more varieties. It is probable that these several forms represent rather differences in degree and distribution than variations in essential character.

The muscular dystrophies are, in general, characterized especially by

¹ *Neurologisches Centralblatt*, October 1, 1883; *Deutsches Archiv für klinische Medizin*, xxiv., 1884, p. 467; *Dystrophia muscularis progressiva*, Leipzig, 1891.

their hereditary or familial distribution, their onset early in life, their preponderant occurrence in males, their progressiveness of course, the frequent presence of enlargement of some of the muscles affected, the disappearance of the mechanical irritability of the muscles, with loss of reflexes and quantitative changes in electric reactions. The disease usually sets in during the first years of life, and affects males rather than females. It is said to occur later in girls than in boys, to be in the former slighter in degree, milder in course, slower in progress, more protracted in duration, and less frequently fatal.¹ Sometimes an hereditary predisposition can be ascertained to exist, the transmission usually taking place through a healthy mother, while male children more commonly suffer. Often a familial distribution can be discovered, and occasionally the disease appears to be congenital. Finally, in a considerable number of cases the source of the disease entirely escapes scrutiny.

Weakness of voluntary muscles is commonly the first symptom noticed, and coincidently, or shortly afterward, the affected muscles are found to be wasted; although often, as has already been indicated, some of them are enlarged, and they are usually firm. In accordance with the distribution of the muscular changes there is impaired mobility of upper or lower extremities or of the face or of the trunk, or of several of these parts in more or less indifferent association. As the muscles degenerate, their reactions to mechanical, electric, and reflex stimuli diminish quantitatively; and late, at an advanced stage of the disease, the feebly opposed action of the less weakened muscles may result in contractions. The action of the sphincters remains unimpaired throughout. Sensibility is in no way deranged. The mental functions do not suffer as a part of the disease *per se*, and they are, as a rule, well performed.

The disease is of long duration and is progressive in course, though sometimes but slowly so. It is not in itself directly fatal, death usually resulting from some intercurrent or complicating or accidental disorder. Pulmonary complications are especially liable to result from weakness of the respiratory muscles. After death the nervous system is ordinarily found to be intact, only the changes spoken of as present in the muscles being found constantly.

The muscular dystrophies are to be distinguished especially from multiple neuritis and degeneration or inflammation of the anterior horns of the spinal cord. From all of these they differ in the distribution of the weakness and the wasting, the muscles of the hands and feet being rarely if ever involved in the dystrophies; in the absence of qualitative changes in the electric reactions of the affected muscles; in the firmness and sometimes the enlargement of the muscles; in the hered-

¹ Gowers: Diseases of the Nervous System, 1892, vol. i., 2d ed.

itary or familial distribution. From neuritis they differ besides in the absence of sensory disturbances. From chronic poliomyelitis or degeneration of the anterior horns of the spinal cord they differ further in the absence of fibrillary contractions; in their onset at an earlier period of life; in the absence of bulbar symptoms, as well as those of lateral sclerosis. Acute anterior poliomyelitis of infancy is a disease of rapid onset and of rather retrogressive than progressive course.

I have been able to collect from the preserved records of the Orthopedic Hospital and Infirmary for Nervous Diseases twenty cases of progressive muscular dystrophy, which, through the kindness of the physicians in charge, Drs. S. Weir Mitchell, Wharton Sinkler, and Morris J. Lewis, and of Dr. Thomas G. Morton, one of the surgeons, I am permitted to report in this communication.

CASE I.—M. E. B., a girl, aged three and one-half years, applied at the Infirmary for Nervous Diseases on October 23, 1873, when a provisional diagnosis of pseudo-hypertrophic paralysis was made. The notes state that the child was born at term, with weak limbs. Its appearance was puny, its abdomen prominent, and its chest convex anteriorly. Its left knee was contracted, and it was unable to stand without aid. The movements of the arms were preserved, though feeble. The left hand could be flexed only with difficulty. All of the movements of the legs were preserved. The posterior muscles of the legs were hard, and there was no wasting of particular muscles. The skin presented no mottling.

CASE II.—W. W., a boy, aged nine years, of German extraction, born in the United States, applied at the Infirmary on July 14, 1886, when the following history was obtained: There were three other children in the family, aged respectively fourteen, eleven, and two and a half years—all well. One child had died of croup. The father was alcoholic, and members of his family were tuberculous. He died suddenly seven months later. There was no knowledge of the existence in any branch of the family of any disorder like that from which the patient was suffering, nor was there other history of nervous or muscular disease. In addition to the usual diseases of childhood the boy had had an attack of pneumonia at the age of four years. At the age of six years it was noticed that the child fell frequently, but no significance was attached to this, as he appeared well and strong. From this period there had been increasing difficulty in walking, without any other manifestation. The boy was fairly well grown for his years. His head appeared small, and the forehead was narrow. The expression was intelligent and the general appearance healthy. The chest was suggestive of rickets; the costal cartilages were slightly prominent; the back was bowed; the abdomen was protuberant. The spine appeared to be slightly curved toward the right. The dorsal muscles were prominent. The calves were large, while the thighs, in comparison, looked small. In rising from the dorsal decubitus the mode of action was quite characteristic. Fourteen months after these observations, it was noted that in walking the boy leaned backward and swayed from his hips. The spine was greatly curved forward in the dorsal and lumbar regions. In arising from the stooping posture the boy climbed up

his thighs. Great overgrowth of the calf-muscles was noted, and these were hard. The overgrowth of the thighs was not marked, while the chest and arms were thin. The knee-jerks could not be elicited, nor could the muscle-jerks in the thighs. The tendo-Achillis jerk was active, the more so upon the left, and the cremasteric reflex was present; so also was the front-tap contraction. A slight epigastric reflex could be elicited. The elbow-jerks were present, though feeble; the muscle-jerks in the arms were active. The chin-reflex was marked. Both testicles were retracted.

CASE III.—A. H., a boy, aged eleven years, entered the Infirmary January 9, 1888. His parents were alive and healthy. They had borne eight children, all of whom were living. The patient had been in good health until the age of eight years, when it was noticed that in running he often tripped and fell. Later, he would fall even in walking. Finally, at the age of ten years, he lost entirely the power of walking. At the same time his knees began to grow stiff. The boy was quite unable to stand, but he could sit up when placed in a chair. The knees were flexed and stiff, the feet inverted. The legs could be moved but slightly. The boy was large, weighing eighty-two pounds. The muscles of the calves and thighs seemed most enlarged, the arms next in degree, and the face, abdomen, and chest least. The gluteal creases were almost completely obliterated. The masseter muscles were hypertrophied. The spinal column presented an antero-posterior curvature. The knee-jerks were wanting on both sides. The mental condition was poor.

CASE IV.—H. D., a boy, aged eight years, presented himself at the Infirmary on October 22, 1888, on account of undue readiness of fatigue in walking. The gait, however, presented no obvious abnormality, and station was steady. There was no complaint of pain. When seated on the floor, the boy was unable to arise without catching hold of something, or by climbing up his thighs. In ascending stairs he placed one hand on the step above him and the other on his knee. It was stated that he had been stout, although he had of late grown thinner. The calves of the legs had not increased in size. Their muscles responded normally to faradic stimulation. The knee-jerks could not be elicited, even with reinforcement. The plantar reflexes also were absent, while the cremasteric and the abdominal were preserved. The angles of the scapula were prominent. A line dropped from the spine of the seventh cervical vertebra fell behind the coccyx, although within the plane of the buttocks. The boy's father had died of pulmonary tuberculosis. A brother and two sisters were living, and, together with the mother, were healthy. No other member of the family had suffered from a disorder similar to the patient's. The boy had had scarlet fever at the age of four years. He had never walked like other children, always presenting a strut. As he grew older he manifested a tendency to fall on attempting to run. When seen a year after his first visit to the dispensary it was learned that for a period of five months the calves had been noticed to be increasing in size, and they were found to be large and hard. At this time, also, the right supraspinatus muscle appeared a little larger than the left. The boy walked well, although he carried his shoulders far back.

CASE V.—F. M., a boy, aged eleven years, applied at the Infirmary for Nervous Diseases on December 5, 1888, walking with his legs spread

far apart, bending the knees but little, and going slightly on the tips of the toes. The station was good, although the patient complained of giddiness when the eyes were closed. After being seated upon the floor he arose by climbing up his thighs in characteristic fashion. He presented decided wasting of the thigh-muscles, particularly anteriorly, while the calves were markedly enlarged. To the touch the latter seemed hardened and smooth. The rhomboids were wasted and the supinator longus on the right was to the eye smaller than that on the left. The knee-jerks were absent, as were also the muscle-jerks in the thighs. There was an older and a younger child in the family; both were well. The sister, who was married, had two healthy children. The patient had had scarlet fever at the age of five years, being kept abed five weeks. Six months later the legs were noticed to be weak, though they were never observed to be unusually large.

CASE VI.—L. S., a boy, aged ten years, applied at the Infirmary on May 3, 1889, when it was related that he had walked naturally up to the age of two years, when he suffered from measles and pneumonia. Immediately on recovering he was found to be weak in the legs. He did not walk at all for four months, and thereafter only imperfectly. The muscles wasted gradually over the whole body. At the time of coming under observation the calves were said to be not as large as they had been. They were hard, and larger in proportion to the other limbs than would be expected from the general wasting. It was said that the boy fell in the street, but he was able to arise from the floor without aid. The knee-jerks were wanting, and no muscle-jerks could be elicited in the thighs. The ankle-jerks were present, though feeble. Faradic irritability was lessened in the extensor muscles of legs and thighs. With the galvanic current K. Cl. C. = An. Cl. C. in the extensors of the legs.

On December 4, 1890, the patient was unable to stand without support. It was thought also that the arms were now weaker than they had been. There was no pain and no tenderness over nerve-trunks. No derangement of tactile or painful sensibility could be detected. There was no local palsy, and co-ordination in the upper extremities was good. The cremasteric and abdominal reflexes were active. The thighs appeared to be turned inward, but there were no contractions.

CASE VII.—J. P., a young man, aged twenty-two years, applied at the Infirmary on September 11, 1889. As a school-boy he had noticed, independently of any preceding illness, that running was difficult and would be attended with a fall. For as long a time as the patient could remember, his thighs and upper arms had been thinner than the rest of his body. When he presented himself he appeared to be a fat, well-built man. He manifested considerable difficulty in rising from his chair, putting his hands on his knees to assist himself in getting up. He walked slowly and would fall on running. When down he had much difficulty in rising. He was unable to extend the legs upon the thighs, while some power of flexion was preserved. There was also loss of power in the upper extremities. With the hands the man was unable to resist a weight of three pounds. The legs and arms were small as compared with the trunk. The calves were large as compared with the thighs. In sitting down he dropped into his chair, and he arose in a characteristic manner. To the sense of touch there was no obvious difference between the superficial and the deep tissues. The knee-jerks were

wanting. There was no pain, and sensibility was preserved. Tremor was developed on extending the hands. The patient was employed as a bag-folder, and his general health had always been good. He was not addicted to the use of alcohol or to sexual excesses, but he chewed a good deal of tobacco. His mother and two sisters were dead.

CASE VIII.—J. B., a boy, aged seven years, applied at the Infirmary on June 22, 1892, presenting a waddling gait, beginning talipes equinus, increasing hollowness of the back, and large, hard calves. The knee-jerks could not be elicited, and he arose from the floor in a characteristic manner. It was learned, further, that the child had been delivered instrumentally at term, and had been principally bottle-fed. He began to walk at the age of two years, and made slow progress, falling often in his attempts. His father was living and had suffered from chronic dysentery for nine years. The mother was living, in good health. He had also a sister and two brothers, all in good health. There had been no death in the family.

CASE IX.—E. W., a girl, aged nine years, was referred to the Infirmary by Dr. G. S. Thornton, of Lewisburg, Pa., on October 19, 1892. Her father had died of heart disease. Her mother and five other children in the family were all healthy. A paternal uncle had been insane. The child was born without difficulty and without instrumental aid. She suffered no injury and had never had a convulsion. She began to talk at an early age, but was mentally not as far advanced as other girls of her age. Her general health was good. She had broken her right hip when six years old. The child was brought on account of weakness of the left leg, which the mother thought dated from birth. She never crawled, and did not walk until the age of three years, when the trouble with the left leg became especially noticeable. The child fell frequently, but wasting was never observed, and there was no weakness in the arms. In walking it was noticed that the child favored the right leg, while in standing the pelvis was tilted toward the left. In picking up objects from the floor she supported herself with the hand on the left thigh above the knee. She was unable to arise from the floor without the aid of a chair or other support—straightening the leg first, then lifting herself with the aid of a chair, and finally gaining the erect posture by supporting herself on the left thigh with her hand. There was a tendency to turn the feet inward. The thighs were wasted and flabby, but the calves were hard and large. The spine was very hollow—S-like. Station was steady. The knee-jerks could not be elicited, even with reinforcement. The tendo-Achillis jerk was present. Elbow-jerks and chin-jerk were wanting. The muscles of the thighs and legs displayed marked quantitative changes in response to electric stimulation, but no qualitative alteration.

CASE X.—C. S., a boy, aged nine years, was referred by Drs. E. S. Riggs and G. A. Mueller, of Allegheny, Pa., to the Infirmary on March 10, 1893. The child's parents were both dead from nephritis. Four sisters were living and well. There was no knowledge of the existence of nervous disease in the family. The boy had had measles in childhood, but no other acute disease. It was thought that he had never been as strong as other children. He was able to stand alone when a year old, and walked soon afterward. He had several falls from chairs, etc., but seemed to suffer no harm therefrom. When he came under observation it was related that he had been gradually losing power in

hands, arms, and legs. For seven months he had been unable to walk up stairs without assistance. The boy looked healthy, and his muscles seemed to be rather over-developed. His appearance was bright and his intelligence and disposition good. All of the bodily functions were apparently well performed. The sphincters were under perfect control. The muscles were large and solid, and movement at all of the joints was free. The muscles of the calves, however, were contracted, so that the feet were thrown into a position of talipes equinus. In standing, the body was supported upon the toes. Walking was impossible on account of the extreme equinus. The spine was curved in lordosis, and the muscles of the back appeared hypertrophied. All of the muscles responded normally to electric stimulation. Sensibility was preserved. The knee-jerks could not be elicited. The skin-reflexes were normal. The pupils were normal. The treatment consisted essentially in massage, and as soon as the physical condition of the child was favorable the tendo Achillis of each leg was divided. The feet were straightened as a result of the operation, but the boy was unable to stand unsupported, apparently from want of power in the muscles of the back and thighs. Later, a plaster-jacket was applied, but rendered little service. The reaction of the muscles to faradism gradually diminished.

CASE XI.¹—P. C., a boy, aged eleven years, was admitted to the Infirmary on March 17, 1894. It was learned that his father was dead—from what cause could not be ascertained—while his mother was living and in good health. A cousin and an aunt had died of pulmonary tuberculosis. At the age of two years the boy suffered a severe illness which was designated a “cold on the chest.” This was followed by a cough, for which cod-liver oil was prescribed. Muscular weakness was first noticed at the age of seven years. Upon admission to the hospital the boy was thin and poorly nourished. He walked with a peculiar gait, the belly being thrown forward and the body rolling from side to side as if to balance some instability of equilibrium. He was compelled to support himself with the nearest object at hand. The knee-jerks could not be elicited, and no anæsthesia could be discovered. The calves of the legs were hard and tense. On attempting to arise from recumbency in the dorsal posture, the boy would roll upon one side, then push himself backward upon his feet with his hands, which he used to support himself with, and continue to rise by resting on his knees and climbing up his thighs. The gait was waddling, the abdomen protuberant, the shoulders thrown back. The calves were very hard, the feet reddish and purple. The boy could stand on his toes, though not on his heels, and he could not jump. The thighs were moderately soft. There was no bellying of the biceps on flexing the arms. The arm-muscles were generally wasted, those of the upper arm more so than those of the forearm. The pectorals were wasted and the latissimi dorsi markedly so. The supraspinati and infraspinati were hard. The scapulæ were markedly alar. The neck-muscles were well developed, though wasted. There was no wasting appreciable in the face and none in the tongue. The knee-jerks could not be elicited, even with reinforcement. Elbow-jerks and triceps-jerks

¹ This case and Case XII. are depicted on page 865 of “A Text-book on Nervous Diseases,” edited by Francis X. Dercum, M.D. (Fig. 284).

were enfeebled. The abdominal reflex was present, the plantar reflex wanting. There was no relaxation of the ankle-joints. The chin-jerk was present. Muscle-jerks could be elicited nowhere. The spine was straight laterally, but there existed lumbar lordosis which could be obliterated by extension. In going down stairs the boy clung to the wall or baluster, and further supported himself by placing one hand on the knee. The calves remained hard. The glutei were normal. The infraspinati were small, but hard. The triceps, biceps, and deltoid appeared normal. It could not be determined whether or not the costal portions of the greater pectoral muscles were normal. The tongue and face were normal, but much fuller than they had been, as a result of the general nutritive improvement. The muscles on the posterior aspect of the left thigh were harder than those on the right. Lifting the patient with the hands in the axillæ brought the shoulders up to the ears. The lordosis, which was marked, was obliterated by the sitting posture, which developed a slight kyphosis. In walking, the gait was rolling and acquired more of the tip-toe character than it had formerly possessed. Fibrillary muscular contractions could not be detected. Cerebral activity was good. There was slight mottling of the legs. Factitious urticaria was readily induced. No electric change was noted.

CASE XII.—A. C., aged nine years, and a brother of P. C., was also admitted to the Infirmary on March 17, 1894. His symptoms, which were much the same as in the case of his brother, though less pronounced, had also been present from the age of seven years, when he began to waste and to become stiff on attempting to walk. The gait was waddling, the belly protuberant. The spine was straight laterally, but presented lumbar lordosis, which could be obliterated by extension. The knee-jerks were absent; also the plantar reflex, the biceps-jerk, and all muscle-jerks. The abdominal reflex and the chin-jerk were present. The calves were soft, but somewhat enlarged. The thighs felt mushy and the arms were generally wasted. The latissimi dorsi were wasted. The supraspinati and infraspinati stood out well. The neck-muscles were normal. There was no appreciable wasting of the face or tongue. The movements of the legs and arms were all present, but enfeebled. In arising from recumbency in the dorsal posture the boy climbed characteristically up his thighs. He could still do many things his brother could not do, his condition being not so far advanced. The glutei were firmer and more prominent than usual. The infraspinati were prominent and hard. The triceps, biceps, and deltoid were normal. No change was demonstrable in the pectoralis. The calves were not so firm as his brother's. The scapulæ were somewhat alar. The boy could be lifted by the shoulders much more readily than his brother. The erector spinæ muscles appeared enlarged. The lordosis was more marked and the abdomen more protuberant than in the elder brother. The patient was able to jump from the floor and also to stand on his toes. He was able, when requested, to arise from the floor without supporting himself with his hands on his legs, but he always grasped the thighs if left to himself. The knee-jerks, though absent spontaneously, could be brought out by reinforcement. Electric examination disclosed enfeebled response of the peronei to faradic stimulation, without galvanic alteration.

CASE XIII.—P. T., a girl, aged seven and a half years, was referred to the Infirmary by Drs. Peeples and J. B. Walker on April 6, 1894.

Her father and mother were well, and there had been no miscarriage. Her grandfather had been paralyzed at the age of eighty years. Her only brother had died of cholera infantum. The patient was the first child, and was born at term after an easy labor, being delivered without instrumental aid. She appeared to be mentally up to the normal standard, but was always weak physically, though there was never any absolute paralysis. The child was nursed at the breast, and had never had a convulsion. It began to speak when a year old, and articulation had always been distinct. At the age of one year it could sit alone readily, but was unable to creep. All movements seemed weak, but the members were never rigid. At the age of a year and a half the child began to "paddle" when seated, the arms being too weak to aid in progression. It moved about thus by sliding until the age of three and a half years, when it laboriously began to creep about on hands and knees. Neither calves nor other part of the body ever seemed enlarged, nor was wasting ever noticed. Power was gained gradually. The child began to walk at the age of three and a half years, and kept on steadily improving, especially after treatment with electricity was instituted at the age of four and a half years. The girl appeared intelligent, spoke well, and displayed a good vocabulary for her years. Station was steady. She walked with her toes turned in and with more or less dragging of her feet. She was unable to go up stairs unaided on account of weakness. With considerable difficulty she could extend her arms high up over her head. She could not arise from the floor without aid—*e. g.*, as from a chair, against which she sometimes pressed her head to gain additional support. Without further assistance she could only arise to her hands and feet. The grasp of the hands was poor. The muscles of the arms were flabby. The elbow-jerks and the muscle-jerks were wanting. The knee-jerks were absent. There was lumbar lordosis. The thighs were proportionately larger and harder than normal. The response to faradic stimulation was lessened in the extensors of the forearms. The head was well shaped. The pupils reacted to light and in accommodation. Hearing was good. The sphincters were under control. All other organs seemed normal.

CASE XIV.—C. C., a boy, aged eight years, was brought to the Infirmary on April 13, 1894. The parents were healthy. Of three other children in the family one was dead from whooping-cough, one from pneumonia, and one was healthy. There had been one miscarriage. The patient was born at term, after a hard labor, the feet presenting; but no instrument was used. He was vigorous at birth, weighing ten pounds. He was nursed at the breast until he was eighteen months old. He began to talk at the age of twenty months, and to walk at the age of twenty-one months. He had one convulsion in early infancy, and an attack of mumps when two years old. At the age of three or four years the mother noticed that the child had difficulty in getting about, but she had never observed whether the muscles were unusual in size or consistency. The boy was brought on account of difficulty in walking and in arising, with obvious weakness. In ascending stairs he was compelled to support himself with his hands upon his thighs. The gait was somewhat waddling, and on arising from the floor the child climbed up his thighs. The calves were increased in size and unduly firm. The thighs and arms were weak and their muscles wasted. The supraspinati and infraspinati were hard. The movements of the arms

and legs were preserved, but enfeebled. The ankles were relaxed. The knee-jerks were absent and could not be brought out by reinforcement. The elbow-jerks were absent. The chin-jerk was present and reinforceable. The plantar reflex was active. The cremasteric reflex and the abdominal reflex were present. None of the muscle-jerks could be elicited. The grasp of the hands was exceedingly weak. The patient could not jump from the ground. There was no wasting of the face or tongue. Sensibility was preserved. The spine presented no lateral deflection, although there was slight lumbar lordosis. The sphincters were perfectly under control. Faradic irritability was lost in the peroneal muscles. The teeth were serrated, but not notched. The foreskin was elongated, but not adherent. Urine was passed frequently, and at night into bed. The ribs were free from beading.

CASE XV.¹—J. R., a boy, aged ten and a half years, presented himself at the Infirmary on January 4, 1895. He had been born at term without complication, and during infancy had been nursed at the breast. At the age of nine months he had whooping-cough and shortly afterward chicken-pox. He learned to speak at the usual time, and his teeth appeared normally, without serious difficulty. No abnormality was noted until the child should have walked, but failed to do so. For a time, at about the age of two years, he was able to crawl and creep, but he had never walked unsupported. He had tried crutches and braces, but without real assistance. For five years he had been using a tricycle. He was unable to set himself in motion, but once started he could continue to propel himself. His intelligence was good. He had never had a convulsive seizure. The motor inability had grown progressively, and the child was utterly unable to stand without support. When seated, the lumbar spine projected forward, leaving the sacrum prominent. The legs and feet could be moved feebly, and the thighs also, though in less degree. Flexion of the thighs was particularly weak. The legs and feet were intensely cyanotic; in some places bluish, in others pinkish, in still others deep red. They were also cold, and their cutaneous covering rough. The calves of the legs and the buttocks were distinctly full and firm, but not indurated. The musculature of the rest of the body was spare. The child was unable to flex the trunk forward, and rotated the spine little and with difficulty. The movements of the upper extremities were well executed. The knee-jerks could not be elicited; nor could the muscle-jerks in the lower extremities. There was no contralateral contraction of the thighs; no ankle-clonus; no tendo-Achillis reflex. The epigastric, abdominal, and cremasteric reflexes were active; the gluteal less so. The erector spinæ reflex was good. The elbow-jerks were preserved, though feeble. The chin-jerk and the infra-orbital reflex were present. The pupils reacted normally. Tactile, painful, and thermal sensibility was everywhere preserved, though more acute in the upper than in the lower extremities. The mechanical irritability of the muscles of the trunk and upper extremities was increased; in the lower extremities it was wanting. The reaction of the muscles to faradic stimulation was enfeebled, especially in the lower extremities. The head appeared rather large; the ears

¹ This patient was exhibited to the Philadelphia Neurological Society on February 25, 1895, and a detailed account of his case appeared in the *Journal of Nervous and Mental Disease*, May, 1895. I have learned of his death since, but am uninformed as to its cause. No autopsy was held.

were prominent. The sphincters were under control. The grasp of the hands was exceedingly feeble, but seemed to be alike upon both sides, although the parents believed the right side to be the weaker. The movements of the upper extremities were free from ataxia. The disposition was bright and cheerful. There was no ocular abnormality. Some of the tendons of the feet had been operated on, but a tendency to valgus remained. The boy had three brothers, who were well and free from obvious abnormality. One brother had died soon after birth in consequence of injuries received during parturition as a result of dystocia due to unusual size. One sister had died at the age of four years, having had spinal curvature and finally meningitis. Another sister died suddenly at the age of nine months during dentition.

CASE XVI.—W. G. C., a boy, aged eight and three-quarters years, was referred by Dr. Ellis, of Iron Hill, Md., to the Infirmary on March 15, 1895. The child, without morbid hereditary predisposition, was born at term after a difficult labor, not, however, requiring the aid of obstetric instruments, and, so far as known, without injury to the head or other part of the body. He was nursed at the breast and escaped the usual diseases of childhood. At the age of one year he fell from his coach, but suffered no appreciable injury. He began to walk when seventeen months old and to talk soon afterward. The family noticed that the boy, in attempting to walk, failed to do as well as other children of the same age; and also that he did not use a spoon well. He seemed well-developed, and the family noticed only the progressive weakness. At the age of two and a half years the boy had some difficulty in micturition, but this was corrected by the administration of belladonna. At one time he was unable to ascend steps on his feet, without placing one hand on the knee and with the other catching hold of some support. When he came under observation he was able to go up stairs only on his hands and knees. In fact, he could arise from the floor only with aid. At one time he arose by climbing up his thighs. In walking he held his legs far apart, apparently as if in an effort to maintain his equilibrium. The station was quite good, even with the eyes closed. In standing, the spine presented a marked anterior curvature in the lumbar region. There was no lateral deviation. The muscles appeared to be fairly developed, but were generally flabby, with the exception of the calf-muscles, which were large and hard. The latter measured eleven and one-quarter inches in circumference on the right and eleven and five-eighths inches on the left. The arm-muscles were not unduly large for a boy of his age. He was able to move his extremities in all directions, but without vigor. There was slight foot-drop. The grasp of the hands was exceedingly feeble. Sensation was normal. The knee-jerks were wanting. The plantar reflexes were present, as were also the tendo-Achillis reflexes; the cremasteric reflex was present on the left, wanting on the right. The abdominal and thoracic reflexes were wanting. There was no humping of the muscles of chest, arms, or thighs when struck a smart blow. The pupils were reactive to light. The fundus presented no lesion, and there was no weakness of any of the internal or external ocular muscles. The feet were cyanotic, but not mottled.

CASE XVII.—N. M. J., a girl, aged sixteen years, of Irish parentage, born in Pennsylvania, presented herself at the Infirmary on September 4, 1895. Her mother had died at the age of thirty-nine years

from "inflammation of the bowels." Her father was said to be "very delicate" and suffered from cough. There were four other children in the family, aged twenty-two, twenty, fourteen, and twelve years, respectively—all in good health. There was no family history of nervous diseases, and all of the relatives were free from any disorder like the patient's. The girl herself had never been seriously ill, except for an attack of measles at the age of two years, one of whooping-cough at the age of four years, and one of influenza at the age of twelve years. Menstruation had not yet appeared. On examination the latissimi dorsi muscles were found wasted, with projection of the angles of the scapulæ, while the supraspinati and infraspinati appeared to be overdeveloped. The movements of the right arm dependent upon the deltoid were somewhat restricted. The calves of the legs were enlarged and hard. The patient was unable to arise from the recumbent posture even by climbing up her thighs. At times she would stumble and fall and be unable to get up. The first symptom had been noticed four years previously, and consisted in a flapping forward of the feet in walking, as though they were unduly heavy. Station was steady. The thighs were poorly developed and flabby. The knee-jerks were absent and could not be brought out by reinforcement. The pupils were equal and reacted to light and in accommodation. The scapulæ were very small, and presented an alar appearance. The arms could not be raised above the level of the shoulders unless carried forward. Movement at this joint was attended with a sense of crepitus, but no pain. The muscles of the back were greatly wasted. The buttocks were firm. Following the attack of influenza the patient was never quite strong. Shortly afterward she was noticed to rock from side to side in walking. Then the left scapula was observed to protrude. Next the arms became weak, the right more pronouncedly so. Finally, the wasting became general. The girl had previously been round and plump. While under observation it was noticed that the movements of the left side of the face were imperfect. The girl had never been able to whistle. The tongue was protruded median. In closing the eyes slowly the left lagged behind. The electric reactions presented no qualitative change.

CASE XVIII.—J. W., an unmarried bass-drum maker, aged twenty-four years, born in Pennsylvania, applied at the Infirmary on October 16, 1895. It was learned that during childhood he had fallen from a second-story window, striking his head. His memory was poor after this, but there was no convulsion or other consecutive disturbance. The patient had had the diseases of childhood, and also an attack of variola at the age of ten years. He denied all history of alcoholism or venereal disease. His father had died of pulmonary tuberculosis. He presented himself on account of general muscular weakness, which had been present since childhood, when he experienced difficulty in getting up from the recumbent posture. On examination the calves were found to be large and hard. The left leg appeared to be the weaker. In walking, the abdomen was thrust forward, most of the weight of the body being brought upon the heels. In arising from the recumbent posture the left hand was rested upon the left thigh. To unaided observation there was no difference between the two sides of the body. The supraspinati and infraspinati were apparently increased in size. The spinal column was free from abnormal curvature. The knee-jerks could not be elicited. The elbow-jerks were preserved. The pupils

reacted well to stimulation. The chest protruded in pigeon-fashion. Heart and lungs were normal. Co-ordination was good and station was fairly steady.

CASE XIX.—E. J. R., a male, aged nineteen years, was admitted to the Infirmary on October 21, 1896. It was learned that his father had died of pneumonia after an illness of one week, while his mother had died of "consumption of the stomach." A brother and two sisters were living and in good health. Two sisters had died of some cerebral disorder. A maternal grand-uncle was thought to have had the same disease as the patient, which was finally transformed into elephantiasis, for which amputation was performed. The father of this relative was supposed to have passed through a like series of disorders. The patient had erysipelas at the age of five years. At about the same time he fell a distance of twenty feet, landing upon his back. He did not lose consciousness and was all right in a short time. He struck the top of his head, without, however, suffering a laceration. At the age of five years weakness of the legs was noticed in ascending stairs, when the hands would be placed upon the knees for support. For three years the patient had remained indoors on account of his disability. In walking he stood upon his toes, without bringing the heels down. He could not rise from the floor without support. At an earlier period of his disease he was accustomed to raise himself by crawling on his knees. Most of the muscles were very much wasted. The calf-muscles, however, were quite full and firm, and the feet in a position of slight equinovarus. Neither knee-jerk nor ankle-clonus could be elicited. The tendo-Achillis reaction was active on both sides. Feeble muscle-reactions could be elicited in the upper extremities. The plantar reflexes were wanting on both sides. When the plantar aspect of the arch of the foot was irritated the external thigh-muscles contracted (*vastus externus*), in greater degree on the left. The cutaneous reflex of the great toe could not be elicited. The cremasteric reflex and the epigastric reflex were wanting, while the abdominal reflex was preserved. Sensibility was preserved. The face appeared to be uninvolved and the tongue was of ordinary size. Speech was not affected, and there had never been a convulsion. The action of the heart was rhythmic, and its sounds were clear. Seated in bed, the patient was able to raise his arms above his head, when the atrophy of the *pectoralis major*, and especially its lower portion, was made conspicuous. The scapulæ exhibited a little displacement, but assumed the alar attitude when the arms were raised. The sphincters were under perfect control.

CASE XX.—G. K., a watchmaker's apprentice, aged twenty-two years, applied at the Infirmary on January 4, 1897. He related that his father was dead in the sequence of an apoplectic attack. His mother was alive and well. He had two sisters, who also were in good health. Neither he nor his mother had knowledge of disease similar to the patient's or of other nervous diseases in the family. The patient had been born at term, without complication, after a pregnancy attended with anxiety on the part of the mother. He had suffered from chicken-pox and mumps in early childhood and from measles at the age of twelve years. Dentition set in early and was uncomplicated. The child learned to speak early and began to walk when a year and a half old. It was noticed that he fell often between the age of three and five years. Several of the falls left cicatrices upon the forehead. There

had never been a convulsion. The patient used no tobacco and indulged only moderately in alcohol. Between the age of eight and thirteen years he had been an inmate of Girard College. The first abnormal manifestations were noticed after the attack of measles at the age of twelve years, and consisted in difficulty in ascending stairs. To accomplish this the patient was compelled to support himself with his hands on his knees and thighs. At about this time, or shortly afterward, difficulty was experienced in arising from the ground. These troubles grew gradually worse, although they had been practically stationary for four years. During this period the patient had walked on his toes. He found difficulty in the use of a lathe which necessitated the use of his feet, and also in cutting metals with his hands. The knee-jerks were absent. The tendo Achillis was shortened on both sides, but its reflex contractility was preserved. The plantar reflex was wanting, while the cutaneous reflex of the great toe was present, and irritation of the sole of the foot was attended with contraction of the flexor muscles of the thigh, more vigorously upon the left than upon the right. The muscle-jerks generally were wanting in the lower extremities. The thighs were greatly wasted, while the calves were greatly enlarged in comparison, and were firm. The buttocks were wasted, as were also the latissimi dorsi and the pectorals and all of the muscles of the upper extremities generally. The cremasteric, abdominal, epigastric, and erector spinæ reflexes were maintained. Feeble muscular and tendinous jerks could be elicited in the upper extremities. The chin-jerk was preserved. The usual lumbar lordosis existed. Sensibility appeared to be preserved. The action of the heart was rhythmic and its sounds clear. The complexion was sallow. The tongue was coated and of ordinary size. The action of the sphincters was controlled. Sexual desire was preserved, and occasional seminal emissions occurred. The appetite was moderate, the bowels fairly regular. Sleep was good; the memory was preserved; eyesight was good with the aid of glasses. Hearing also was good. The electric examination disclosed only quantitative changes.

It will be noticed that the cases are of mixed type, with a predominant tendency to muscular pseudo-hypertrophy. Of the whole number, but four occurred in females—20 per cent., and a proportion of 1 to 4 in males. Gowers,¹ in speaking of pseudo-hypertrophic paralysis, gives the proportion as 1 to from 4 to 7; idiopathic muscular atrophy, he states, is less uncommon in females. In 24 cases of pseudo-hypertrophy seen personally² he found the proportion 1 to 7 (3 females, 21 males), and among 220 cases collected from various sources the proportion was 1 to 6.3 (30 females, 190 males). Among 84 cases Poole³ found 11 in females and 73 in males (1 to 6.6). Eichhorst⁴ quotes Seydel as having found among 125 cases 22 in girls and 103 in boys (1 to 4.7).

So far as could be ascertained, the first symptoms in the cases here

¹ Diseases of the Nervous System, 1892, vol. i., second edition.

² Pseudo-hypertrophic Muscular Paralysis. A Clinical Lecture. London, 1879.

³ New York Medical Journal, 1875, xxi. p. 569.

⁴ Handbuch der speciellen Pathologie und Therapie, Bd. iii., 4. Aufl., 1891.

reported were noticed in none later than the thirteenth year; in 2 at birth; in 2 during the first year; in 2 during the second year; in 2 during the third year; in 2 during the fourth year; in 3 during the sixth year; in 1 during the seventh year; in 3 during the eighth year; in 2 during the ninth year, and in 1 during the tenth year. The ages of the patients at the times when they came under observation were as follows: three years, 1; seven years, 2; eight years, 3; nine years, 4; ten years, 2; eleven years, 3; sixteen years, 1; nineteen years, 1; twenty-two years, 2; twenty-four years, 1. In only two of the cases (XI., XII., in brothers) was it definitely ascertainable that similar disease existed in any other member of the same family, although in one other case (XIX.) the statement, which, however, could not be verified, was made that a great-grandfather and a grandfather had suffered from a like disorder. These findings are not in accord with the results of the analysis made by Gowers,¹ of 220 cases, of which 102 were isolated and 118 occurred in 39 families. Erb² gives the proportion of hereditary and familial cases as 56 per cent. In six of Poole's cases³ other members of the family had also suffered from a similar disease.

In 11 cases, one or more of the infectious cases had preceded the onset of the dystrophic manifestations. In two the labor was said to have been difficult; in a third instruments had been used in the delivery; in a fourth the mother had suffered from dystocia in a previous labor, on account of the large size of the child; and in a fifth it was stated that the mother had been subjected to considerable anxiety during the pregnancy. In three cases there had been falls upon the back before the advent of the symptoms of the muscular trouble. The father of one patient had been alcoholic and his family tuberculous; the father of another had died in the sequence of an apoplectic attack. An uncle of another patient had been insane. The grandfather of one had been paralyzed. Of another patient one sister had died of meningitis, and one during dentition.

I desire to call attention to the contraction of the muscles of the upper part of the thigh noted in Cases XIX. and XX., when the sole of the foot was gently irritated, notwithstanding the absence of the plantar reflex. I have since observed a similar phenomenon under other conditions when the plantar reflex was not interfered with. I am as yet unable to say anything as to the frequency of its presence or as to its significance. It is probable that it is an entirely normal manifestation, and it may be that attention has already been directed to it.

In speaking to Dr. S. Weir Mitchell upon the subject of the muscular

¹ Pseudo-hypertrophic Paralysis. A Clinical Lecture, 1879.

² Dystrophia muscularis progressiva. Leipzig, 1891.

³ Op. cit.

dystrophies, he raised the interesting question as to the occurrence of this group of disorders in colored persons and especially in those of pure, unmixed African parentage. It is known that chorea and locomotor ataxia are exceedingly rare in blacks, and it is probable that exophthalmic goitre and other diseases are so likewise. In none of the cases here detailed is any specific reference made to the race of the patients, and it is not unfair to assume that even those cases in which definite knowledge upon this point is wanting occurred in white persons, inasmuch as the matter of race has always received especial consideration at the Infirmary, and the physicians under whose care they were have no recollection of ever having seen a case in a colored person. The literature of the subject is quite enormous, and I have not taken pains to scour it; but nowhere have I seen any reference to the occurrence of the dystrophies in other than white persons, and my personal experience, together with information derived from a variety of sources, points to the rarity of these diseases in blacks. In the hope of determining this question, I addressed letters of inquiry to a number of neurologists and general practitioners in different parts of the country, whom I take the opportunity here of thanking for their courtesy in replying. I append extracts from some of the communications received:

Dr. Curran Pope, of Louisville, writes: "I have had almost daily contact with the colored race in dispensary practice, and . . . they constitute about 65 per cent. of the people attending the clinics in this part of the country. I have never seen a single case of any of the muscular dystrophies in the full-blooded African or mulatto race. . . . I have seen cases of every atrophy and dystrophy, especially the idiopathic, either in dispensary or private practice, but all have been in the white race."

Dr. Hugh Hagan, of Atlanta, Ga., writes that he has seen three cases of progressive muscular atrophy of Aran-Duchenne type in negroes, two pure Africans and one a mulatto. He states further that he has seen a case of upper-leg atrophy in a negro porter, and one of scapulo-humeral atrophy in a farm-hand. He believed that the blood of the latter was not pure, although the patient maintained the contrary. Of the Erb type he has also seen one case in a colored child of undoubted syphilitic parentage.

Dr. M. S. Iseman, of Georgetown, S. C., writes that he can recall but one case of muscular atrophy in a negro, and that was evidently one of anterior poliomyelitis.

Dr. F. X. Dercum states that "I have never seen a myopathy in a colored subject. Muscular atrophy of spinal origin I have seen quite frequently."

Dr. C. W. Burr says: "I have seen one case of idiopathic muscular

atrophy occurring in a young mulatto boy. I have never seen a case in a pure black, but do not know whether it is really infrequent."

Dr. W. Peyre Porcher, of Charleston, S. C., expresses the opinion that "these neuroses are extremely rare in the negro race, although the true paralyses are by no means uncommon."

Dr. Landon Carter Gray states that he has seen only "isolated cases of muscular atrophies in colored persons, for we do not see much of this race in our clinics."

Dr. B. Sachs writes that he has "not seen a single case of muscular dystrophy in a colored person, nor have I any knowledge of its occurrence among persons of unmixed African parentage."

Dr. J. Hendrie Lloyd states that he cannot recall having seen examples of the muscular dystrophies in negroes. "My general impression is that these dystrophies are rare in the unmixed African races."

Dr. Charles K. Mills writes that he cannot recall any cases of muscular dystrophy in colored persons. "I am inclined to the opinion that these affections are extremely rare in the colored race."

Dr. M. Allen Starr writes: "I have never seen a case in a colored person."

Dr. William Osler does not remember any case of muscular dystrophy in a colored child.

Dr. Henry Posert, of Memphis, Tenn., writes that among the cases of atrophies and dystrophies that he has seen there has been none in an individual of pure or impure African parentage. "I am sure," he adds, "that if any cases had been in town or in the neighborhood I would most likely have seen them." Dr. Posert refers to a typical case of facio-scapulo-humeral atrophy (Landouzy-Déjérine) combined with pseudo-hypertrophic paralysis.

Dr. A. Earle Boozer, of Columbia, S. C., writes that he has not had any experience with the muscular dystrophies, and inquiry among his local colleagues discloses the fact that they, too, have not observed examples of the disorder.

Dr. George J. Preston, of Baltimore, Md., is unable to recall any case of muscular dystrophy in a negro. "Like certain of the degenerative cord-diseases," he says, "it must be rare."

Dr. J. A. Witherspoon, of Nashville, Tenn., states that he is unable to find recorded in his note-books a single case of muscular dystrophy in the pure negro.

Dr. Rudolph Matas, of New Orleans, informs me that he has some remembrance of a case of pseudo-muscular hypertrophy in a negro child and one of general atrophy in an adult, but nothing that he could describe accurately. He goes on to say, further: "On the general basis

that the negroes are much less liable to nervous diseases than the whites, I would be inclined to believe that muscular dystrophies and atrophies are not so frequent among them as in the white population. As bearing upon this question I would quote the statistics on nervous diseases in the Charity Hospital. In the decennium 1884-1894 there were 4312 patients with nervous diseases in the in-door services of the hospital; of this total 77.9 per cent. were whites and 22.1 per cent. colored. The actual mortality was 18.46 per cent. in whites, and 33.89 per cent. in the colored. The decennial prevalence (ratio to hospital population) was 7.43 per cent. in whites, 4.95 per cent. in the colored, or 74 cases of nervous disease in 1000 white patients and 49 in 1000 colored. The decennial mortality was 1.37 per cent. in whites (14:1000) and 1.68 per cent. in the colored (or 17:1000)."

Of the pathogenesis of the muscular dystrophies we know absolutely nothing. As they manifest themselves almost invariably in the early period of life, the thought naturally arises that they may be due to some aberration in development. On the other hand, as the muscular affection is variable and widespread in distribution and progressive in course, it is not unreasonable to suppose that it may be dependent upon a general metabolic disturbance, such as may arise from derangement of some internal secretion. It is on account of the latter reason that the view promulgated by Macalister¹ is entitled to thoughtful consideration. This observer has formulated the hypothesis that all of the glandular structures of the body elaborate substances that exert a controlling influence upon the growth of individual tissues. In those morbid conditions characterized by hyperplasia or hypoplasia of a single tissue-element, there may be supposed to be an absence or a perversion of the secretion that physiologically controls the growth of that particular element. The occurrence of the muscular dystrophies corresponds in time with the period of functional activity of the thymus gland, and it is thought that premature cessation of the secretion of this gland may be responsible for the trophic changes that take place in the muscles. Upon the strength of this hypothesis, which, it must be admitted, is not without plausibility, the employment of thymus gland or of an extract of the gland has been recommended in the treatment of the muscular dystrophies. I am not aware, however, that this suggestion has been acted upon except in the one case in which Macalister himself pursued the plan I proposed, and the results of which are not stated. Lépine² has, however, employed thyroid gland in the treatment of two cases of muscular dystrophy, in both of which increase in muscular vigor followed, and in one also increase in the size of wasted muscles.

¹ British Medical Journal, No. 1684, p. 729.

² Lyon Médical, May 10, 1896, p. 35.

TABULAR SUMMARY OF CASES.

No.	Name.	Sex	Age at appli- cation.	Age at first symp- tom.	Similar disease in relatives.	Nervous disease in relatives.	Previous disease of childhood.	Complicated labor.	Trauma- tism.
1	M.E.B.	F.	3½ yrs.	Birth.					
2	W. W.	M.	9 "	6 yrs.	.....	Father alcoholic.	Pneumonia, 4 years.		
3	A. H.	M.	11 "	8 "					
4	H. D.	M.	8 "	8 "	.....	.....	Scarlet fever, 4 years.		
5	F. U.	M.	11 "	5½ "	.....	.....	Scarlet fever, 5 years.		
6	L. S.	M.	10 "	2½ "	.....	.....	Measles, pneumonia, 2 years.		
7	J. P.	M.	22 "	7 "					
8	J. B.	M.	7 "	2 "	.....	.....	.....	Instrumental delivery.	
9	E. W.	F.	9 "	Birth.	.....	Uncle in saue.			
10	C. S.	M.	9 "	1 year.	.....	.....	Measles.		
11	P. C.	M.	11 "	7 yrs. }	Brothers.	.....	Pneumonia.		
12	A. C.	M.	9 "	7 "		.....		
13	P. T.	F.	7½ "	1 year.	.....	Grand- father paralyzed			
14	C. C.	M.	8 "	3 yrs.	.....	.....		Hard labor ; large child ; no instru- ments.	
15	J. R.	M.	10½ "	1½ "	.....	Sister meningi- tis ; sister dead den- tition.	Whooping- cough, chicken-pox.	Dystocia with another child unduly large.	
16	W.G.C.	M.	8¾ "	1½ "	.....	.....		Difficult labor ; no instruments ; no injury.	Fall from coach at one year ; no sequel.
17	N.M.J.	F.	16 "	12 "	.....	.....	Measles, 2 years : whooping- cough, 4 yrs ; influenza, 12 years.		
18	J. W.	M.	24 "	5 "	.....	.....	Variola, 10 years.		Fall from 2d story window in childhood.
19	E. J. R.	M.	19 "	5 "	Great- grand- uncle ; grand- uncle.	.....	Erysipelas, 5 years.		Fall on back at 5 years.
20	G. K.	M.	22 "	3 "	.....	Father, apoplexy	Chicken-pox, mumps, measles.	Mother suf- fered anxiety during preg- nancy.	

REVIEWS.

THE ELEMENTS OF CLINICAL DIAGNOSIS. By PROFESSOR G. KLEMPERER, Professor of Medicine at the University of Berlin. First American edition, from the seventh (last) German edition. With sixty-one illustrations. Authorized translation by NATHAN E. BRILL, A.M., M.D., Adjunct Attending Physician, Mount Sinai Hospital, New York City, and SAMUEL M. BRICKNER, A.M., M.D., Assistant Gynecologist, Mount Sinai Hospital, Out-patient Department. New York: The Macmillan Company; London: Macmillan & Co., Ltd., 1898.

ONE of the most popular compends on clinical diagnosis in Germany has been the little work of G. Klemperer, of Berlin, the first edition of which appeared in 1890. The seventh German edition has been translated into English by Brill and Brickner, preserving very nearly the form of the German work as regards size, shape, type, figures, etc., so that it is in reality a reproduction of the original. Even the Latin terms for diseases are retained.

Whatever may be the views of the teacher or the practitioner as to the value of these compends there can be no question as to their popularity among students. A really good condensation of the main facts of medicine systematically arranged, as is the case in this book, meets with the student's approval, and the book sells.

The great marvel in this book is not so much that a great deal has been crowded into a small space, as that it has been done so systematically.

The great trick in packing a trunk is not alone to know what to leave out, but also to know in just what way to put in the necessary articles so that they shall occupy the least possible space without injury to themselves or their neighbors. One marvels at the compactness and neatness with which Klemperer has tucked in his facts, and only finds an explanation of his ability to do this work so well when one remembers that he has for some time been engaged in the work of teaching small classes. He has learned what facts students need; he knows where the student is likely to fail and what points need emphasis. It is, therefore, valuable as a book to be consulted in reviewing for examination, or for hints as to the nature of some obscure concrete case on which the student is working, or to give him a rapid knowledge of the place occupied by a certain disease in its relation to other diseases; in other words, to afford a quick general survey of the subject.

The great danger from the use of these books is that from their very nature statements must be brief and often dogmatic. The student has impressed upon him the typical cases. The numerous exceptions puzzle him when he meets them in practice, because they do not fit in with the arbitrary statements of the compend. Many of these statements, if taken literally, are not true: "Systolic murmur over the aorta is diagnostic of aortic stenosis" (p. 169). "Actual murmurs, audible without pressure, heard over peripheral arteries, prove the presence of an aneu-

rism, and are usually palpable" (p. 171). "A systolic murmur over the mitral denotes insufficiency of the mitral" (p. 169).

These are all true within certain limits. But if these sentences are memorized by the student and looked upon by him as infallible guides, he will commit errors in diagnosis, and will find at some autopsy, to his astonishment, that the systolic murmur over the aorta did not mean any stenosis of the aortic valve.

While Klemperer may have some good reason for believing that auscultation in mitral insufficiency is practised in the second left intercostal space (p. 168), and that pericardial friction-sounds are not synchronous with the heart's beat (Herzaction) (p. 170), and that the pulse is slow in mitral stenosis (p. 178), these statements, at variance with what is generally taught by good clinicians, deserve explanation that would take but little space and would enable the student to realize that on some points in medicine authorities may differ. Several other dogmatic statements that, if not erroneous, at least call for explanation, are found in other parts of the book than in the chapter on the Heart, from which we have made our selections.

Brief portrayments of all the important diseases, condensed discussions of such topics as physical diagnosis, pulse, fever, examination of secretions, blood, urine, the animal and vegetable parasites, the disorders of metabolism, etc., are as clearly given as could be expected in so small a space. Three pages on the use of the Röntgen ray as a diagnostic aid are appended.

For a small compend of clinical diagnosis the work is an excellent one, and the translation has been well done, the terse sentences of the original with its omission of unnecessary adjectives, articles, and verbs being preserved in the English.

J. B. H.

DIE TECHNIK DER SPEZIELLEN THERAPIE FÜR AERZTE UND STUDIERENDE. VON DR. F. GUMPRECHT, Privatdocent in Jena. Mit 181 Abbildungen im Text. Jena: Gustav Fischer, 1898.

TECHNICS OF SPECIAL THERAPY. By DR. F. GUMPRECHT.

THE great development of applied therapeutics in Germany in recent years had as a notable evidence the comprehensive handbook of Penzoldt and Stintzing, in six large volumes, now in its second edition. The present work is still more noteworthy, partly because of its intrinsic value, partly because it is the product of one who has hitherto been known only as an accomplished and energetic investigator in many departments of internal pathology and diagnosis. Under such men as Fürbringer and Stintzing he has been able to acquire a valuable experience in the treatment of disease, which saves this book from being merely a well-arranged and very full compilation.

The title is difficult to render into English, the original being misleading when we remember there are technics of purely medicinal treatment, with which the volume before us has nothing to do. The author says that his aim was to limit the subject on the one side where the work of the nurse, on the other where that of the specialist begins. We cannot do better than continue the quotation: "Difficult and complicated manipulations like laryngeal operations, uretero-cystoscopy, gastroscopy, and pure cutting operations are omitted. So we have

intubation, but not tracheotomy; pleural drainage, but not costal resection; urethral divulsion, but not urethrotomy." The topics include the mechanical treatment of the mouth, nose, pharynx and larynx, œsophagus, stomach, intestines and rectum; thorax; abdomen; puncture of special abdominal organs; lumbar puncture; nerve stretching; suspension; catheterism; treatment of strictures and enlarged prostate; local treatment of the urethra; subcutaneous drainage in anasarca; bleeding, transfusion, and vaccination. These are described with great detail, with the single exception of vaccination, which the author no doubt thinks is sufficiently well known, as it no doubt is in Germany. As an example of the plan followed, an outline of the chapter on the Stomach may be given. In this are described the limits and objects of instrumental treatment; anatomic data; historical note; lavage and its indications, relative and absolute; method; accidents to the apparatus and to the patient; stomach douche; the questions as to time, frequency, and duration of lavage; electric treatment; massage; special methods of treatment for the pylorus. In every detail we discover not only a very full command of the literature, especially German, but also a very well-digested personal experience. The style is clear, the mass of facts often relieved by incidents in practice or personal reminiscences. The work, therefore, fills a unique place in medical literature, and must be especially valuable to those who have to treat all kinds of diseases, though even specialists will find the book useful for easy reference. Many physicians fail to carry out such operations as are here described because they do not know how. It is true that such things should be learned in hospitals, but they can be learned from books if properly read, and this one is superior to any we know for that purpose. In general all the methods recommended are such as are in common use among experienced physicians everywhere, but there are some things that show the independence of the German and his ability to get along with simple apparatus. For example, the author recommends the removal of obstructions in the stomach tube by blowing, telling how to avoid being surprised by the patient vomiting during this procedure. We think one might reasonably object to being considered squeamish ("heikel") because he does not care to blow up the colon by the mouth as practised by Furbringer. The hand-bulb is surely more convenient. In bleeding, the author recommends the old operation with the lancet, instead of the time-consuming operation by laying bare the vein usually practised by those educated in modern surgical technique.

The typographical arrangement of the book is excellent; useful bibliographical lists are appended to each section, and a well-arranged index completes what must be pronounced a most admirable guide to the art of medicine.

G. D.

THE GENESIS AND DISSOLUTION OF THE FACULTY OF SPEECH. A Clinical and Psychological Study of Aphasia. By JOSEPH COLLINS, M.D. Awarded the Alvarenga Prize of the College of Physicians of Philadelphia, 1897. New York: The Macmillan Company; London: Macmillan & Co., Ltd., 1898.

THE author of this work has studied carefully the literature of aphasia, and has presented the most recent views held by some of the

best writers on this subject. The influence of the teaching of Dejerine is clearly seen throughout the book; so much so that one would be inclined to think that it had been written by a pupil of the distinguished French master. It may, therefore, be looked upon as the best exposition in English of this French school, and yet we should be sorry to give the impression that it is a mere copy. Collins has thoroughly digested all he has read, and has given us much that is original. No work on aphasia can ignore the study of those who have preceded us.

The definition of aphasia as a "term used to indicate any disturbance or perversion of intellectual expression" is certainly far-reaching and misleading, and includes lesions of the peripheral neurons. Many will object to classifying disturbances of speech, such as are seen in bulbar paralysis, under aphasia. We find Collins himself, in describing Elder's case, saying "there was no aphasia," although the patient had, apparently, "incapacity to enunciate words," and it would have been better had the foot-note on page 155, in which the views of the author are more clearly stated, appeared nearer page 14.

We can state in a few words the position taken by Collins in his conception of aphasia, and it will be seen at a glance how closely he follows Dejerine. There is a speech-zone about the left Sylvian fissure in right-handed persons, comprising the foot of the third frontal, the posterior part of the first temporal, and the angular gyrus. Lesions of any part of this zone affect speech as a whole, with special manifestations according to the area diseased. A centre for acoustic images of words is found in the first temporal convolution, one for visual images of words in the angular gyrus, and one for articulatory kinæsthetic images in Broca's area. Destruction of the fibres leading to or from these centres causes subcortical or pure forms of aphasia. A special centre for writing does not exist. Collins reviews the testimony in favor of this centre, and rejects it. Broca's area is not a motor region. In it are stored the articulatory kinæsthetic images; it is a controlling centre for the cortical motor areas, but the cortical representation of the muscles of speech is elsewhere. The whole speech-zone, therefore, according to Collins, is sensory. Vision is represented in the occipital lobes, but a higher centre of vision is located in the left angular gyrus.

We fully agree with the author when he says that the terms "ataxic aphasia" and "amnesic aphasia" are indefinite, and should, therefore, be avoided. We agree with him also in the statement that the integrity of the frontal lobes is essential to the full exercise of complex thought; but might not the same be said of any of the cerebral lobes? The reviewer has found the entire left occipital lobe destroyed in a feeble-minded individual, and believed that this stood in causal relation to the feeble mentality.

The chapter on the History of Aphasia is short, as this is not the most essential part of the work, but we should have been pleased to find a little more attention paid to certain writers.

We fear that Dejerine's views, as understood by us, are very different from those attributed to him on page 101. The inferior pediculo-frontal fascicle seems to us a very unfortunate name. Presumably, the inner bundle of the cerebral crus is meant, but this passes through the cerebral peduncle, and possibly terminates in the pons. We might as well call it the fronto-capsular bundle. Must this tract "go"? Are all anatomists agreed on this point? The reviewer, from his microscopical

studies, is convinced that some of these fibres arise anteriorly to the Rolandic convolutions, and he is not alone in holding this opinion.

Collins reports a number of interesting clinical cases, some with necropsy, but none with microscopical examination. These cases have been studied clinically with much care.

The case reported by Banti and quoted on page 167 was probably one of pure or "subcortical" motor aphasia, due to a cortical lesion, and, since the recent publication by Dejerine and Sérioux of a case of pure word-deafness due entirely to cortical lesions, we may well ask whether the term "subcortical" will not have to be abandoned.

We find the influence of Dejerine again in the statement that a patient with cortical motor aphasia is agraphic, except in writing from copy, and is dyslexic.

Dynamic aphasia is always of the greatest importance, and the case reported on page 354, due to bromide intoxication, is one of considerable interest. Our knowledge of aphasia as a complication of Raynaud's disease is increased by the report of a case.

We are not quite prepared to accept the statement that "tumor presents the ideal lesion" in localizing speech centres. Tumor causes many symptoms by pressure, and this truth has been recently clearly shown in a case reported by Oppenheim, in which symptoms of aphasia were dependent on the position of the patient. A tumor was found at the necropsy. Areas of softening are more focalizing in their symptoms.

We echo the author's words when he speaks of the necessity of microscopical study in every case. He who depends on gross appearances alone in studying the nervous system will be led into great error. Lesions of vast importance are sometimes detected only with the microscope.

The directions given on page 380 are not in accordance with the teaching of Dejerine. Redlich's case was one of lesion in the occipital lobe, and the sections were frontal ones.

The possibility of complete restoration of the cortex supplied by the Sylvian artery after it has been injured by occlusion of this vessel in childhood must be regarded with some scepticism. Extensive sclerosis of this part of the cortex has been found after such lesions.

Although the author believes that theoretically there are grounds for the belief in conduction aphasia, he is liberal enough to acknowledge that all the cases which have been reported may be looked upon as manifestations of sensory aphasia.

We have mentioned merely some of the most striking features of this interesting and valuable book without attempting to do full justice in a brief review.

W. G. S.

THE ETIOLOGY AND PATHOGENESIS OF YELLOW FEVER. By Prof. G. SANARELLI. *Il Policlinico*, 15 Agosto, 1897.

THIS is an article of 100 pages with several colored plates and photographs, and gives the detail of the investigation of the author on yellow fever. The work is divided into two parts. In the first part he considers:

1. The existing knowledge on the etiology and pathogenesis of the disease when he began his investigations.

2. The isolation of the specific organism.
3. The character of the anatomical lesions produced in man by the disease.
4. The morphology and biology of the bacillus icteroides.
5. The comparative pathology—results of inoculation.

In the second part of the article he gives the results of his studies on the toxin produced by the bacillus, and considers the general pathology of the disease, modes of infection, etc.

Yellow fever has long been recognized as a disease of specific character, but its etiology has not been known in spite of the many attempts which have been made to discover a specific organism in connection with it. The description of the clinical features of the disease does not differ from that given by Sternberg and others. The investigations of the author were made partly at the quarantine station at Montevideo, and partly at Rio Janeiro. Thirteen cases were examined, and in seven a peculiar bacillus was isolated which he regards as the cause of the disease.

In the second case examined this organism was found in the blood taken before death, and in the blood, spleen, liver, lungs, urine, and bile at the autopsy. In all these places the organism was found in pure culture, but in the kidneys and bronchi it was associated with the colon bacillus. It was rarely found in pure culture, and most often was associated with some of the pyogenic cocci or with the colon bacillus. In the seventh case the cultures gave an abundant pure growth of the streptococcus pyogenes in all the organs. He thinks the reasons why this bacillus has not been discovered before are the small numbers in which it is found and the probability of secondary infection from the alimentary canal by other organisms, which may obscure the presence of the bacillus icteroides. The most common of the secondary infections are by means of the colon bacillus, the streptococcus or the staphylococcus aureus. These organisms may produce a true septicæmia and themselves lead to the death of the patient. From the result of cultures it is shown that the bacillus is not contained in the intestinal canal, but in the blood, by means of which it may be carried into all of the organs. The lesions found in the organs consist of extensive and diffuse degeneration, and are due to the action of toxins produced by the bacillus. The most profound lesions were found in the liver, which may present but little evidence of alteration on macroscopic examination. Microscopically there is extensive fatty degeneration, followed by complete destruction of the cells. The degenerative lesions in the kidney, though marked, were not so extensive as in the liver. He was not able to demonstrate the bacillus in sections of the tissues made in the ordinary way, but on keeping large portions of the tissue in the thermostat for twenty-four hours, thereby allowing the few organisms present to undergo a further development, he found them in fair numbers. The lesions in the stomach consist in mucoid degeneration and desquamation of the epithelium. The black vomit is a hemorrhage which takes place from the exposed vessels.

The bacillus icteroides is a small rod, rounded at both ends, ciliated, 2 to 4 micromillimetres long, and two or three times as long as it is wide. It has no peculiarities of staining. It grows readily on all of the artificial media, and growth may take place at a temperature of 20° C. The most characteristic cultures are those on gelatin. After twenty-

four hours the colonies appear under a low power as small transparent or slightly granular masses very similar to leucocytes. When the colonies are abundant and growing within the medium, they remain small and become converted into small opaque points. On the surface they grow rapidly and preserve their brilliant, slightly granular appearance. One of their most characteristic features is the gradual appearance of a small dark spot in the centre. After eight, ten, or twenty days the colonies undergo a slow and gradual transformation. They assume a yellowish or brownish tint, and fissures running to the centre of the colony or concentric lines appear in them. The bacillus produces abundant acid.

The organism was pathogenic to all animals inoculated. The most important inoculations were made on dogs, and the lesions were very similar to those found in man. In some cases death took place from acute septicæmia in twelve to twenty-four hours, and in others the disease ran a more protracted course. Autopsies showed sometimes acute gastritis, with necrosis and exfoliation of the lining epithelium, laying bare the bloodvessels from which hemorrhage took place. The spleen was usually found enlarged. Microscopically there was the same fatty degeneration of the liver, with the destruction of cells, which he found in man. The blood of the animal always contained a large amount of urea; in some cases as much as 4 per cent. He considers the lesion to be the result of a toxin circulating in the blood, and the intestinal lesions are very analogous to those which may be produced by the poisons of certain bacteria and by cyanide of potash. The excessive amount of urea in the blood is due to the degenerative lesions of the kidney. The bacillus produces not only a general intoxication, but its toxins have an elective affinity for certain organs, as the kidneys, the digestive canal, and the liver. Many of the symptoms are due to uræmia, which comes from the anuria, the result of the degeneration of the kidneys. The hemorrhagic character of the intestinal lesion is due to the action of the poison, which produces profound alterations in the bloodvessels. The lesions produced in the mouse, the guinea-pig, and the rabbit are of the same general character, and proved fatal in the first in five days, in the second in six to eight days, and in the third in five days. In the dog the clinical features were frequently almost exactly the same as those seen in man, and consisted in vomiting, hæmatemesis, hæmaturia, albuminuria, gastro-enteritis, nephritis, jaundice, profound fatty degeneration of the liver, uræmic intoxication, and secondary infection. There are three different properties of the virus. The first he calls the steatogenous, which produces the fatty degeneration; second the hemorrhagic; and, third, the emetic property. He made a number of experiments with filtered cultures of the organism, and injected a small amount of the toxin into five men. The symptoms produced were analogous to those of true yellow fever. In one of them he obtained by aspiration some of the parenchyma of the liver and kidney, and found in the cells the same degenerative lesions which he observed in the definite disease. He thinks the jaundice in yellow fever may be of hæmatogenous origin, because he was never able to find bile pigment in the urine nor in the fluid of the tissues. It is probably due to destruction of the red corpuscles of the blood accompanied by hepatic insufficiency. The nephritis and consequent uræmic intoxication is the result of a specific action of the toxin on the renal parenchyma.

He is not certain as to the manner in which the organism enters into the tissues, but he thinks it may do this in a number of ways. Most of the facts seem to favor the transmission of the organism by means of the atmosphere. It is interesting to find that moulds favor in an inexplicable way the growth of the organism, and to this is probably to be attributed the influence of dampness in favoring the spread of the disease. In some cases the disease seems to appear more frequently in the houses on the north side of the street, these houses being more damp and favoring the growth of moulds. The organism appears easily killed by heat. It is destroyed by one minute exposure to a temperature of 65° and by a three-minute exposure to a temperature of 60° moist heat. It is killed in dry heat in ten minutes at a temperature of 100° , and at once at a temperature of 120° to 125° . It stands dryness extremely well. Cultures are quickly sterilized by direct sunlight.

The article impresses one as a careful piece of work by an experienced bacteriologist. The pathological and anatomical descriptions of the lesions are not as accurate as they might be. He has overlooked the fact that the most important lesions in the liver consist in a general and diffuse necrosis of the cells, occurring principally around the central veins of the lobules, and which may occur with but little fatty degeneration. His conception of the general pathology of the disease and the relation of the organism to the lesion is certainly very reasonable. Whether or not the definite etiology which he claims be confirmed by future investigations, the work constitutes a valuable addition to our knowledge of this very obscure disease.

W. T. C.

CONSTIPATION IN ADULTS AND CHILDREN. By H. ILLLOWAY, M.D., Formerly Professor of the Diseases of Children, Cincinnati College of Medicine and Surgery, etc. Pp. xv., 495. New York: The Macmillan Company, 1897.

THIS work deals especially with habitual constipation and its treatment by mechanical methods. Commencing with the anatomy and physiology of the intestine, the author takes us over the etiology, symptomatology, diagnosis, prognosis, and consequences of this symptom. Under treatment massage is given a prominent place, and is fully described and illustrated by various figures of more or less artistic merit. Hydrotherapy and electricity receive suitable attention. Medicines are discussed in a brief chapter. Next conditions other than atony are taken up and full directions presented. A chapter devoted to formulas ends the first part, which deals with this symptom as found in adults. About a hundred pages are occupied with constipation in infants and children. The book is well arranged, thoroughly classified, and shows an extensive acquaintance with the existing literature both medical and surgical. For all that mechanical methods are those upon which the author lays great stress, nowhere does he take the extreme position that drugs are useless. In fact, he directly contradicts those who pander to popular taste in decrying the use of drugs when he expresses his scepticism that purgative-taking is a cause of constipation (p. 101). Even further than this, the extensive formulary which

he presents demonstrates his belief that if drugs alone cannot afford relief, they certainly are necessary adjuncts to massage, graduated resistive movements, and a regulated diet. For the last there are found excellent directions. He differs with some of his contemporaries in believing that the closet should be visited at least once daily shortly after a meal (not of necessity after breakfast), thus relying upon an "irregular regularity" (p. 187) to secure satisfactory evacuation. He also condemns the fashionable practice of drinking hot water on rising in the morning (p. 193). The points for criticism lie in faulty orthography in pharmacopœial terms and designations, and in peculiar abbreviations. These may be overlooked when we consider the thoroughness with which he has treated—we might say, exhausted—the subject, and the many practical points which are so frequently encountered.

R. W. W.

A SYSTEM OF MEDICINE. Edited by T. C. ALLBUTT, M.D. Vol. IV. Diseases of Obscure Causation; Alimentation and Excretion. The Macmillan Company, 1897.

THIS volume is the most interesting one of the series which has yet appeared, and the high excellence of the papers contributed makes the *System* one of permanent value. We cannot mention all the well-known men who have written articles for this volume, but among them are such authorities as Drs. Church, Cheadle, Garrod, Lauder Brunton, Fenwick, Hale White, Sir William Roberts, Mr. Bowlby, Mr. Treves, the editor, and many others. Vol. IV. begins with General Diseases of Obscure Origin, including Rheumatism and Rheumatoid Affections, Rickets, Gout, Diabetes, etc.; then follows a chapter on Diseases of Alimentation and Excretion, which, beside comprising affections of the entire digestive tract, includes also Diseases of the Peritoneum, Subphrenic Abscess, etc.

The general arrangement of the work is excellent, and the study of the maladies is made clearer by special introductions on the general pathology of digestion and secretion, and on the physiology of fecal evacuation. There is a chapter on Shock and Collapse, which follows the paper on Secretion and precedes the one on Diseases of the Mouth. Dr. Cobbett has discussed the two conditions in a clear and able article, but we do not quite see the justification of its introduction at this place. Such articles as do not deal with disease, it seems to us, would be better grouped together in one volume by themselves. Dr. Playfair's paper on Abdominal Diseases from a Gynecological Standpoint is also out of place, from our point of view.

We do not wish to find fault with the individual contributions, but it appears more markedly in this volume than in others, that not sufficient attention is given to the relative length of the papers; for instance, the longest one in this volume is by Mr. Treves, on Intestinal Obstruction, which covers eighty-five pages; the shortest, three by Mr. Bowlby, on Osteitis Deformans, Acromegaly, and Hypertrophic Pulmonary Osteoarthropathy, to which but six pages are given. The condition of intestinal obstruction is one which concerns the surgeon more than the physician in the great majority of cases, and, as its interest is very

largely in the anatomical findings, the reason for the introduction of so long a paper on this disease is not self-evident. It is, however, an article of intrinsic value, from the extreme care with which each possible form of obstruction has been described.

Perhaps Mr. Bowlby is right in not devoting more space to three diseases of such obscure origin as those mentioned, but we feel as if they were treated, although succinctly, in too cursory a manner. Massalongo has lately expressed a view that in hypertrophic pulmonary osteo-arthritis the changes in the bones have nothing whatsoever to do with the pulmonary complaint, but are due to other causes, and that rheumatism, syphilis, etc., may be factors in the causation. When we consider that all the pulmonary changes with which the disease is associated are much more frequently found without any alterations in the long bones, it is only fair to admit that Massalongo's theory may be the right one, and that the name "secondary hypertrophic osteo-arthritis," which he suggests, is better than the one by which the disease is commonly known.

Diseases of obscure causation offer many points for differences of opinion, and for this reason it is, perhaps, not worth while to take up any of the papers at length and discuss them. It is noteworthy, however, that Dr. Brunton, in his article on Constipation, says almost nothing on the value of aperient waters, nor mentions the use of a cigar after breakfast. Dr. Spender, in discussing the origin of rheumatoid arthritis, lays much weight on its association with tuberculosis. At the British Medical Association, held at Montreal in 1897, the subject of rheumatoid arthritis came up for general discussion, and Dr. James Stewart, in his address, referred to the relationship of these two diseases, but did not find that close causal connection on which Dr. Spender seems to insist. Dr. Stewart said "indirectly a tuberculous tendency may, by lowering the resistance, tend to bring about a rheumatoid arthritis, and it is only in this sense, as I understand it, that there is a connection between the two diseases." This opinion seemed to meet with common agreement of those present at the discussion, and it is as yet doubtful whether any closer connection between the two diseases does exist; it seems improbable.

We feel justified, in concluding this review, in stating that this is the best *System* at present being published, and that it is one which every student of medicine should possess. The length of some articles and the arrangement of others may not be the best, but taken as a whole the work is one of very high excellence, due both to the ability of the editor and to the first-rate selection of contributors. R. N.

HANDBOOK OF MATERIA MEDICA, PHARMACY, AND THERAPEUTICS. By SAMUEL O. L. POTTER, A.M., M.D., M.R.C.P. Lond., Professor of the Principles and Practice of Medicine and Clinical Medicine in the College of Physicians and Surgeons of San Francisco; Medical Superintendent of St. Mark's Hospital. Sixth edition fully revised, and greatly enlarged. Pp. xv., 900. Philadelphia: P. Blakiston, Son & Co., 1897.

THIS edition comes to us with an increase in size commensurate with the additions to the resources of the physician, with new sections and

others extended and rewritten, so that the volume becomes a fair presentation of the subject as it stands to-day. In the portion devoted to therapeutics there is to be found still greater revision and elaboration. Of special interest are the articles upon toxins, antitoxins, and animal extracts, in which the author has presented a careful digest of current literature and reached an opinion as regards their value which can be accepted as one that will not be reversed during the next decade. In this he has separated the anticipation from the realization, the theoretical from the practical, and the presumption from the proof. An interesting feature is the insertion and brief description of a considerable number of unofficial remedies of greatly varying importance and usefulness which are constantly met with in medical journals. Concerning some he speaks in no uncertain terms: for example, concerning aseptolin (p. 78), "There is nothing original in this treatment, it being a repetition of the phrenic acid injection of Declat combined with the pilocarpine treatment of phthisis announced about two years ago as the 'discovery' of Dr. Waldstein. It is now going through the usual puffing methods of trade promotion, and the few independent reports upon its use show no special merit for it in these diseases" (tuberculosis, malaria, and other diseases due to germ infection). More frequent examples of frankness on the part of therapeutic experts would prevent a large number of practitioners from becoming dupes. In Part III., *Special Therapeutics*, sandwiched between *Surgical Shock* and *Sneezing*, we find a short article on sick-room. It is a very sensible plea for, and description of, a room to be set apart in every home. But if the author believes that "the possession of such an appendage to the home would enable the owner to defy the mandate of the health officer in regard to removing an inmate thereof," he fails to appreciate the crass ignorance, gross contempt for law, and innate venality of these officials as they are commonly met with. A knowledge of their cupidity would be of more importance than the establishment of a sick-room. The appendix contains a very complete list of contractions and Latin phrases, various formulas of solutions for hypodermatic use, patent medicines, tables of differential diagnosis, clinical examination of the urine, weights and measures, and other matters—truly a miscellaneous collection. The treatment of poisoning has been thoroughly revised and extended, leaving this subject in a very satisfactory condition. We have, in reviewing former editions, objected to the alphabetical arrangement of the *materia medica*, for the reason that the subject becomes solely a matter of memory on the part of the student. We find each year, in examination of candidates for hospital positions who have been graduated from different schools, that *materia medica* is less thoroughly learned. Whether the reason for this is the indifference or faulty methods of teachers, press of other and more attractive studies, or the dictionary text-books, we are not prepared to state; of the fact we are certain. On the other hand, the very great excellence of the section devoted to special therapeutics, which is so far in advance of the usual index of diseases that the work is of especial value to the junior practitioner, and in this lies, we believe, its value, which has been demonstrated by the publication of succeeding editions. Further, its well-considered optimism appeals to the faithful practitioner, while the frankness and clearness in style encourage him in his reliance upon its teachings.

R. W. W.

PROGRESS OF MEDICAL SCIENCE.

THERAPEUTICS.

UNDER THE CHARGE OF

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The Treatment of Consumption.—DR. SAMUEL WILKS has adopted a uniform treatment of this disease. In the first place, if a person is pursuing any course of life in which disease of the lungs is developing, that course must be altered. The remedy is not medicine, but fresh air; probably the very best air is to be found in the highlands of a southern climate. How far low barometric pressure is beneficial has not yet been proved, although it is likely of some importance. Sunshine quite possibly may be one of the conditions favoring recovery; it may be directly destructive to bacilli, as the warmth and the beauties of the landscape brought out by it indirectly excite the interest of the patient and revivify his nervous system.—*The Practitioner*, 1898, No. 360, p. 571.

DR. JAMES E. POLLOCK states that the communication of tuberculous disease by contact with or breathing the same air as persons suffering from that affection has been thoroughly investigated at the Brompton Hospital for Consumption, which affords the most abundant material. The possibility of its production by inoculation of a healthy animal with morbid matter has been proved beyond question. That, however, is a very different matter from the possibility of tuberculosis being conveyed by mere contact, however close to a patient so affected. The investigation covers a period of thirty-seven years. Of resident medical officers there were four; none had phthisis. Of about one hundred and fifty house physicians, eight became consumptive; in only one was the disease contracted in the hospital. Of six matrons, none had phthisis. Of one hundred and one nurses, one only had phthisis while in the hospital; three died of this disease after leaving the hospital. Of dispensers there were twenty-two: three died of phthisis. One was intemperate, one took ill two years after he left, and the remaining one died in the hospital. Of physicians and assistant physicians there were twenty-nine, of whom one died from phthisis. There were no deaths from

phthisis among the gallery maids, who sweep and clean floors several hours daily, nor among the secretaries and clerks. This evidence negatives the idea of phthisis being an infectious disease under such circumstances as being grouped in a hospital, breathing the same air, and living under the same conditions as others similarly affected. Later investigations have proved that consumption is communicable, although not by personal contact, and that its existence depends upon its transmission from one tuberculous individual to another. Such transmission is not aërial, but resembles more the process of inoculation. A certain amount of diseased product must enter into the animal economy, whether by the lung or the intestinal tract. It is recognized that the sputum of tuberculous patients, if dry, may be such an agent, and that the flesh and milk of tuberculous animals may convey the poison. In accordance with these views the sputum and excreta of consumptive patients are received into vessels containing a 20 per cent. solution of carbolic acid, and, together with the general refuse of the hospital, are consumed in an automatic destructor. All soiled linen and handkerchiefs are boiled, and all cups, spoons, etc., used by patients are disinfected in boiling water. The decrease in the death-rate must be attributed mainly to the improved drainage of the hospital, more cleanly habits, removal of insanitary surroundings, better dwellings, and a higher status of comfort in the lower classes.—*Ibid.*, No. 360, p. 609.

DR. HECTOR MACKENZIE presents a thoroughly sensible article upon the medicinal treatment. All that we know of the disease is not very encouraging to the hope that an efficient antitoxin will be found. So far from immunity being acquired from the successful passing through the disease, the reverse may be asserted—namely, that susceptibility is increased once the bacillus acquires a successful footing in the body. Cod-liver oil has played an important part in the treatment for half a century. Although it is one of the best remedies which we possess for chronic cases, it is probably less in favor than formerly. As for creosote, while few are prepared to state that it has any specific action, most will admit that it has very valuable properties. Various preparations and derivatives of creosote have been found useful. Arsenic, or the arsenical mineral-water of Mont Dore, has been employed from very early times, and few drugs are believed to be more useful at the present day. The paper concludes with a brief consideration of the treatment of fever, night-sweating, hæmoptysis, and cough.—*Ibid.*, No. 360, p. 687.

The Open-Air Treatment of Pulmonary Tuberculosis.—DR. C. THEODORE WILLIAMS quotes Brehmer's laws: (1) That the sanatorium, to avoid dust, should be away from public traffic, and (2) that the air should be dry and aseptic, and yet there should be abundant rainfall. The leading principle is that the consumptive should pass the greater part of his time in the open air, protected from the weather, and, as a rule, in the prone position, and that at night he should sleep with windows open. This can be carried out in covered balconies or terraces suitably arranged. To resist cold the prone position is far better than sitting, probably on account of the equalizing effect it has on the circulation and the less strain which it exerts on the heart. Degrees of cold can be endured when lying down which would

cause chill in a sitting posture. This life in the open air hardens the invalid against fresh cold, increases the appetite, promotes sleep, reduces night-sweats, and, most important of all, lowers pyrexia. The objections to the reclining system are that, in advanced disease, it is not well adapted for cleansing cavities by expectoration, and, in incipient disease, without exercise, it is generally impossible to maintain the muscles and functions of the body in proper order. Opinions vary as to the necessity and extent of exercise. The dietetic treatment is that of stuffing with a rich and varied diet, including much meat, milk, fatty and farinaceous foods, and vegetables, given in large quantities at a time, with, in most cases, moderate intervals between meals, but sometimes very frequently. If the open-air treatment is to be introduced into any country, it must be modified, if it can be done without sensibly impairing its utility, to suit the spirit and habits of the people, and this can be done in country or even suburban houses.—*British Medical Journal*, 1898, No. 1951, p. 1309.

DR. ARTHUR RANSOME points out that neither a particular latitude on the earth's surface nor any great altitude can be considered necessary in establishing a place to carry out this treatment. Climate may, and does, prolong the existence of the phthisical, either by modifying nutrition and vitality in the mass, or by lessening the activity, perhaps warding off the occurrence of certain secondary states (bronchitis, hæmoptysis), which might of themselves have proved the real causes of death. No climate will stamp out phthisis, wherever acquired, either in the individual or in the stock. Of the results obtained, seventeen patients treated at Bournemouth have furnished the data. All were tuberculous, as shown by the finding of bacilli, save two. One of these did not expectorate; the other was a child, aged four years, with signs of a cavity at the apex of a completely consolidated lung, who completely recovered. Of these, two gained twenty-eight pounds in weight; one nineteen; nine others from five to twelve; one was stationary, and of four the weight was not taken. In seven the disease is now quiescent, and has been for periods of from one to two and one-half years, and they may be classed as relative cures. Five others are now quiescent, and have been for from four to six months, although they must be regarded as still under suspicion. One has improved, and three improved for a time, then relapsed, and the disease is now progressing. These patients show results which are inconclusive, but seem favorable to more prolonged trial of the system.—*The Lancet*, 1898, No. 3902, p. 1603.

Oil of Cloves in the Treatment of Pulmonary Tuberculosis.—DR. H. A. HARE, in an address before the Medical Society of the State of Ohio, calls attention to this remedy, used both by the mouth and hypodermatically, for the purpose of decreasing cough and expectoration in advanced pulmonary tuberculosis. If given hypodermatically, five drops are mixed with thirty to sixty minims of the best French olive-oil, sterilized; considerable local pain is produced for a few minutes, but soon the anæsthetic effect of the oil asserts itself, and the relief from cough more than repays for the pain. The injection is given once daily into the loose tissues of the back. Internally, it is best given after meals in five, ten, to even fifteen-drop doses, but cautiously, as these may disorder the stomach. Not only are the

cough and expectoration greatly decreased, but the sweat and hectic fever are generally modified to very great extent.—*Therapeutic Gazette*, 1898, No. 5, p. 289.

How to Administer Creosote.—DR. CHARLES WILSON INGRAHAM gives his patient an empty twelve-ounce bottle, in which four drops of beechwood creosote of a superior quality are placed. The second day five drops are put into the bottle, and so increased one drop each day until fifteen drops are taken each day. Now one drop is added every second day until the limit of twenty drops is reached. Later the dose is increased at the rate of one drop every third day until twenty-five drops per day are taken, and this must not be exceeded. After the prescribed daily amount of creosote is placed in the empty bottle it is filled with fresh water and the entire contents taken in equally-divided doses at regular intervals, making at least six or eight doses daily. The bottle must be thoroughly shaken before each dose. In this way the irritation of the throat so generally met with in pulmonary tuberculosis is directly relieved, the expectoration promoted, and the irritating cough benefited.—*Therapeutic Gazette*, 1898, No. 5, p. 299.

Thiocol.—DR. C. SCHWARZ recommends this substance, which is a potassium salt of guaiacol sulphonate, as a new remedy in the treatment of tuberculosis. This occurs as a fine white powder, at first of a somewhat bitter, later, sweetish taste, and contains about 60 per cent. of guaiacol. Its advantages, as claimed, are its absence of odor, great solubility in water, absolutely unirritating properties as regards mucous membranes, and its ready absorbability. This is given in from 150 to 220 grains daily. It increases the appetite and general strength, the patient gains weight, the cough is lessened, the expectoration ceases to be purulent, the night-sweats disappear, and fever comes to an end. For other conditions, as chronic bronchitis, typhoid fever, and intestinal catarrhs, it should prove useful. Two instances of its use in pulmonary tuberculosis are briefly reported.—*Klinisch-Therapeutische Wochenschrift*, 1898, No. 19, S. 716.

Orexin as a Stomachic.—DR. FREDERICK KOLBL has obtained good results from the use of this drug in chlorosis and anæmia, in anorexia of convalescents after severe illnesses, in nervous dyspepsia, hysteria, and neurasthenia. It may be given with good results in the diminishing appetite found in early and chronically developing pulmonary tuberculosis, in slight cases of gastric catarrh, in anorexia accompanying valvular diseases of the heart, and chronic myocarditis. In every case of vomiting in pregnancy this symptom was relieved in the course of a few days. It is contraindicated in all cases of acute inflammation and ulceration of the mucous membrane, and in all cases of hyperacidity and excessive gastric secretion, such as is found in acid dyspepsia. The dose is from one and one-half to three, increased to seven, grains daily, in a little cold water. The best time for the administration is about one hour before the chief meals—*e. g.*, dinner and supper—and it should not be followed by a large quantity of warm liquids. The best method is as a pill, each containing the minimum dose above given.—*The Therapist*, 1898, No. 5, p. 112.

The Action of Formaldehyde on Digestion.—M. LINOSSIER reports his observations made in the laboratory. The remarkable antiseptic properties of this substance and its relative harmlessness suggest its use as an intestinal antiseptic. Formal (a 40 per cent. solution of formaldehyde), in from 0.19 to 2.50 parts *per mille*, was employed. The results were that these solutions retarded all forms of digestion. This was most marked in the pancreatic digestion of albumins; the action of the saliva, gastric juice (pepsin and milk), and pancreatic amylase is not markedly hindered unless larger doses are employed than can safely be introduced into the alimentary canal.—*Bulletin Général de Thérapeutique*, 1898, 21e liv., p. 811.

Treatment of the Summer Diarrhoea of Infants.—Dr. ALEX. LEWERS believes that it is more rational to say that milk should be stopped because, under existing conditions, it has no chance of being digested than because it is a poison. As for irrigation, it probably has the same action internally as externally, viz., stimulant and sedative, the tone of the intestinal wall being improved and peristalsis lessened. As for routine treatment, if vomiting is not prominent, either castor-oil or calomel to clear the intestine, and then bismuth to soothe it. If vomiting is severe, small doses of calomel and Dover's powder, or stomach lavage, followed by bismuth, are still the most satisfactory. Astringents and antiseptics are useless, and there is no golden rule of diet, except to stop the milk.—*Intercolonial Medical Journal of Australasia*, 1898, No. 4, p. 212.

A New Treatment of Syphilis.—M. LALANDE states that this medication is obtained by the prolonged action of sodium chloride upon organic matter rich in keratin ($C_{51}N_{17}H_6S_8$). The keratin from the horns of ruminants is richer in sulphur. To prepare this the horns of a calf are powdered. The maceration, with daily agitation for a month, is conducted at a temperature of 77° to 86° F. The formula is as follows: Powdered horn, 60; sodium chloride, 10; distilled water. This is now left in a dark room for four months. After decantation it is heated for half an hour in a closed vessel at 194° F., and after cooling the vessel is opened. The liquid is limpid, clear, and yellow, of an odor suggesting burnt horn, and of a salty taste. It must be preserved from light. It contains gelatin, 5.30; calcium phosphate, 0.30; calcium sulphate, 0.03; sodium chloride, 8.37; potassium sulphate, traces, to water, 194° F., 1000.00. This has been employed in the treatment of thirty patients during the past two years: primary lesion, 9; secondary period, 19; tertiary period, 2. Of these ten had previously received mercury. The liquid is injected hypodermatically, under aseptic precautions, in dose of from one to three-fifths of a teaspoonful, into the infrascapular fossa or lumbar region, at from one to eight day intervals. The first injections are followed by pain. The liquid is rapidly absorbed. Three hours later appear a moderate elevation of temperature, some somnolence, and possibly sweating. There is no diuresis nor albuminuria; several times urea has been increased. Benefit generally follows the third injection; the mucous patches dry, the syphilides disappear, and ulcerations heal. From ten to thirty injections suffice for cure, which is not followed by relapses.—*Les Nouveaux Remèdes*, 1898, No. 8, p. 169.

The Treatment of Syphilis of the Nervous System.—DR. J. W. COURTNEY insists upon the inadequacy of the usual two-years' treatment of the secondary manifestations as a prophylactic against the outbreak of this disease in the nervous system. Gowers recommends that every syphilitic subject, for at least five years after the date of his last secondary symptoms, should have a three-weeks' course of treatment twice every year, taking for that time twenty or thirty grains of iodide a day. If only one drug is to be used in the treatment of active cerebro-spinal syphilis, by all odds mercury by inunction is preferred, although the value of the combined use of this with iodide is unquestionably greater than that of either alone. The mercurial inunction should be vigorously prosecuted; a drachm should be rubbed in daily for six days, then allow an intermission of a day, on which the patient takes a warm bath. The process is then repeated (unless some decided contraindication arises) until thirty or forty inunctions have been made. In the mean time potassium iodide is ordered in increasing doses until a drachm or two are taken per diem. Attention to the hygiene of the mouth cannot be too strongly insisted upon during this time, and all tobacco and alcohol should be withdrawn. In treating symptoms due to the thrombotic occlusion of a vessel, it should be remembered that the thrombi are not syphilitic, and that consequently the patient's general condition may be seriously impaired by drenching him with iodide. To such gummata as do not yield to medicinal treatment the same rules for surgical procedure apply as for tumors of different nature.—*Annals of Gynecology and Pediatrics*, 1898, No. 8, p. 574.

The Treatment of Gastric Hyperacidity.—DR. ELLIOTT P. JOSLIN states that if the motility is at fault the general condition is to be benefited, and rowing and golf, by strengthening the abdominal muscles, will give support to the overloaded organ. Massage by a skilful operator may empty the stomach, and so be of value. Electricity is of no use. Only one drug is of value, and that only when given in a particular way: ten drops of the tincture of nux vomica thrice daily, increasing one drop daily until a maximum daily amount of sixty to ninety drops is reached. Should these measures not suffice, the stomach-tube should be employed. This, however, is exhausting, and besides a large amount of food is in this way removed from the body. In one instance the estimation of the nitrogen in the stomach washings revealed the fact that nearly one-fourth of all the food given by the mouth was removed by the tube on the following morning. As the stomach absorbs no water, it is in these severe instances of hyperacidity associated with gastric dilatation that thirst is troublesome. This is best relieved by nutrient enemata of normal salt solution. Food is also absorbed extraordinarily well by the rectum, and in one instance 87 per cent. was so taken up. Rationally, an albuminous diet is wrong in hyperacidity, but all acknowledge the temporarily good effects of proteids, and in the milder cases the symptomatic treatment seems indicated rather than the rational: carbohydrates for the severe, and proteids for the mild form. Yet the author has almost invariably satisfaction with the proteid diet. On giving carbohydrates, since the ptyalin is soon destroyed in the stomach, foods in which the starch has been converted into dextrin are indicated or diastase administered. The pain arising from the acid itself may be neutralized in various ways, the

simplest of which is to dilute the acid with liquid. This, of course, should not be encouraged, for fear of producing trouble with motility, and thereby augmenting the existing condition. Another means is to give a diet which will combine with the excess; this is the albuminous. That this is powerful in its action is shown by the fact that two or three eggs will combine with a pint of 0.2 per cent. hydrochloric acid. Further, the products of proteid digestion—that is, peptones—have the power of combining with a greater quantity of hydrochloric acid than the original proteids. This fact suggests that it would be more rational to administer peptones. The aim should be to give food in small bulk, and such preparations as malted milk tablets may be of service. If held in the mouth for some time they may be useful in increasing the alkaline saliva; thus the organism furnishes its own alkali. As for the alkalies proper, all agree that they are temporarily of great use, though in time they lose some of their power and are purely symptomatic. Combined with bismuth, their action is promoted. The special variety is not of importance, but large doses must be given. No matter what the treatment or rule of diet is in any case of stomach trouble, it should be always borne in mind that the marasmus of probably all stomach patients, excepting those with cancer, arises from the diminished amount of food eaten. Patients can get along without a stomach, but not without food.—*Boston Medical and Surgical Journal*, 1898, No. 17, p. 389.

The Therapeutic Value of Strophanthin.—DR. E. STAHR concludes that (1) the crystallized strophanthin from a particular maker given by the mouth is not a strong poison, in that it can be safely administered to five-eighths of a grain daily. (2) It has no cumulative action. (3) When given in quarter-grain doses it increases the flow of urine. (4) It has no untoward action. (5) The patients note that attacks of palpitation are not so frequent or severe. Whether this results from the drug or from the rest which they obtain in the hospital is not clear.—*Therapeutische Monatshefte*, 1898, Heft 5, S. 245.

[The large doses employed and the general results obtained from them are so entirely opposed to those obtained by competent observers that it is evident that the preparation employed was inert.—R. W. W.]

Fleiner's Method of Treating Hyperchlorhydria.—DR. B. OLIVETTE introduced through a stomach-tube from one hundred and fifty to three hundred grains of bismuth subnitrate suspended in water before breakfast each day for about three weeks. Four patients were under observation. From these he concludes that: (1) Large doses of bismuth are well borne by patients suffering from gastric ulcer and hyperchlorhydria, and give rise to improvement as to subjective symptoms not only during but after the treatment. (2) This improvement is not permanent, but more marked in ulcer than in true hyperchlorhydria. (3) The doses necessary for betterment vary from 150 to 230 grains for each administration. (4) The exhibition of these doses has no marked influence upon either the quantity of the gastric fluid or the motility of the stomach. (5) By this method the hydrochloric acid content in hyperchlorhydria was very slightly diminished, and this cannot explain the improvement in the subjective manifestations (gastric irrita-

tion, pain, and vomiting). The explanation appears to be that the bismuth forms a protective coating over the gastric mucous membrane which protects it from the hyperacid gastric juice.—*Therapeutische Monatshefte*, 1898, Heft 4, S. 181.

MEDICINE.

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New Bacilli Resembling those of Tuberculosis.—MOELLER, in a preliminary note (*Deutsche med. Wochenschrift*, 1898, No. 24), reports the finding of these bacilli on timothy and other grass and in the feces of cows, horses, swine, goats, and mules. (Tuberculin-tests showed the animals to be free from tuberculosis.) They resemble the bacillus of Koch in size and shape and in their resistance to acids and alcohol, but differ in rapidity of growth on various media and in various minor points described in the original. They also have certain points of difference as compared with the bacillus discovered in butter by Petri and Rabinowitsch, the bacillus of leprosy, and that of smegma. Severin and Capaldi have probably found the same bacilli in dung, but were not able to cultivate them, as Moeller was. The latter thinks there is a close relationship between the timothy bacillus and that of dung; and also, as the result of certain experiments described, that the various bacilli which resist acids may be made to assume the characteristics of others of the same kind. Inoculations with pure cultures gave interesting results. In guinea-pigs there was infiltration, with central caseation at the seat of inoculation. The lymph glands were enlarged; the pleural cavities contained an excess of fluid; the mesentery and peritoneum showed numerous small grayish-white and yellow nodules; similar nodules were in the spleen, which was much swollen, and the liver. The lungs contained nodules, and in one case cavities, one of which was three-fourths of a centimetre in diameter. The nodules and the contents of the cavity contained large numbers of the bacilli. Cats, rats, pigeons, and hens were immune. The changes, on the whole, were much like those of experimental tuberculosis, but the cavity formation was more like that in human lungs than anything usually seen in experiments. Histologically, the changes resembled those of tuberculosis to a certain extent. Giant-cells were rare, and, so far as examined, did not have peripheral nuclei. In some cases the lesions were not so much like those of tuberculosis. The further details will be awaited with interest.

Motor Tests and Disturbances of Motion in Sciatica and Lumbar Pain.

—MINOR (*Deutsche med. Wochenschrift*, 1898, No. 24) summarizes as follows the results of some investigations he has made: 1. Patients with sciatica or lumbago are not able to rise from the sitting position with extended legs, without the use of the hands. In all cases of lumbar pain after cold, trauma, caries, etc., in which the pain is bilateral, the body is raised as in typical cases of pseudohypertrophy of the muscles; the arms are brought forward, and finally the body is extended.

2. In typical sciatica the arms are placed behind the body so as to displace the centre of gravity backward, then one hand is pushed from the floor, while the body is balanced on the other.

3. Inasmuch as these motor alterations are purely objective, they enable one to make a more accurate localization of the pain than can be obtained from the patient's statements, and also furnish more reliable guides to the intensity of the pain and its alteration during treatment.

4. In traumatism, as of the coccyx, these tests will show whether the injury is especially unilateral, even if the subjective sensation indicates affection of both sides.

5. Knowledge of these disturbances of motion, especially of that in sciatica, may be of great value in case of suspected simulation. So, if the patient uses the lumbar method in rising from the floor, simulation is probable.

The author advises that the method be studied at first in well-marked cases of lumbago and sciatica.

Toxæmic Delirium in Heart Disease.—EICHHORST calls attention to a condition sometimes seen in cases of cardiac insufficiency, especially in those cases in which rapid disappearance of œdema and cyanosis and greatly increased excretion of urine follow proper treatment. Eichhorst's routine treatment consists in the administration, when rest in bed alone is not followed by marked improvement, of powders containing 1 decigramme of digitalis powder, 1 gramme of diuretin, and 3 decigrammes of sugar. Three daily doses are given, and in most cases thirty powders are sufficient to restore compensation. The urine is always rapidly increased, and may amount to five or even seven litres daily. The symptoms to be described occur during the diuresis, and are more likely to appear in old persons than in younger ones. The first thing noticed is usually somnolence, which may be so deep that it is difficult to arouse the patient. Soon the consciousness is disturbed; the patients do not recognize their acquaintances or surroundings. Delirium then comes on, varying in degree up to violent mania. The respiration is often altered, being deep and frequent, without evidence of obstruction. The face is red. Muscular spasm was not observed in any case. These symptoms last until the œdema is gone, and polyuria has been followed by normal excretion, and then cease gradually or suddenly. In no case was there albuminuria; hence the author excludes ordinary uræmic poisoning, and attributes the symptoms to an intoxication from unknown bodies derived from the œdematous fluid and not excreted rapidly enough by the kidney. In no case was the condition actually dangerous.—*Deutsche med. Wochenschrift*, 1898, No. 25.

Metabolism in Acute and Chronic Leucæmia.—MAGNUS-LEVY (*Archiv für path. Anat., etc.*, Bd. clii., H. 1) gives the result of his examinations on the extensive material in the Urban (Berlin) Hospital. The differences in metabolism in the two classes of cases were very striking. In acute cases there was a large amount of urine and notable increase of total nitrogen and uric acid, with increasing excessive excretion of nitrogen up to the end. In chronic leucæmia there was a moderate amount of urine and normal nitrogen, without an excessive excretion before death. An excessive metabolism is characteristic of acute leucæmia, but, as the author shows from his own material and the literature, this is not constant. In contradiction to many other investigators, the author denies a constant relation between the number of leucocytes and the excretion of alloxur bodies, but finds these in some cases directly, in others inversely, proportional. On the other hand, he thinks that the constant loss of blood in acute leucæmia increases the albumin metabolism directly. He also thinks that the sudden diminution in oxidation injures the cells and leads to increased breakdown. One case showed an enormous increase of phosphoric acid, which the author thinks was derived from nuclein. In five cases of leucæmia he found uric acid four times; hypoxanthin was always present, sometimes in large amounts; xanthin only in traces; pleural and pericardial alloxur bodies in proportions similar to those in the blood, but the former contained less, corresponding to the smaller number of cells.

Pyopneumothorax Examined by X-Rays.—KIENBOCK (*Wiener klin. Wochenschrift*, 1898, No. 22) has made some interesting observations on a case of closed pyopneumothorax. The latter has existed for several months, on the left side. The heart and diaphragm, at first much displaced, gradually returned to their former positions, though the heart and mediastinum became adherent to the right pleura. The right lung showed signs of a tuberculous infiltration. The left lung was infiltrated and retracted. The fluorescent screen showed differences corresponding to the changes indicated by the physical signs, and not necessary to describe. The most interesting phenomena consisted of certain movements visible in the screen. In inspiration the level of the fluid rose about three-fourths the width of an intercostal space. The level of the fluid, in addition, showed waves independent of the respiratory changes, partly synchronous with the heart-beat, but there were also waves, seen when the breath was held, due to shaking of the floor. Percussion of the thorax also caused visible waves, and shaking the patient caused waves of considerable height, up to 10 cm. The author suggests several explanations for the respiratory change of the level of the fluid. It might be due to a contraction of the diaphragm, made convex downward by the fluid, or to increased abdominal pressure forcing the diaphragm up. Narrowing of the left side by displacement of the mediastinum was excluded by inspection with the screen. The pulsation of the fluid seems to confirm Traub's theory of the cause of pulsating empyema, viz., by direct transmission of the heart-beat to the fluid. That it was not due in this case to compression of air could be demonstrated by putting the patient in such a position that the heart was surrounded by air. The pulsation ceased, and only began again when the apex was submerged. The absence of visible or

palpable pulsation was, perhaps, due to the low tension of the air in the thorax, or to the thickening of the costal pleura, and makes it probable that pulsating empyema is much more frequent than ordinary methods of examination would lead us to think.

Severe Cerebral Symptoms and Death from Excessive Dilatation of the Stomach.—VON JÜRGENSEN reports (*Deutsches Archiv für klin. Med.*, Bd. lx. p. 327) the case of a farmer, aged forty-three years, who for ten years had occasional attacks of pain, fullness, and sense of oppression in the epigastrium after meals. Anorexia and excessive appetite alternated; during the attacks vomiting was frequent. The patient was emaciated, pale, and sallow. The abdomen was distended, the superficial veins prominent. The stomach was much dilated in all directions, but the exact outlines were not made out during life. The patient refused mechanical treatment, and was treated by wet-packs, diet, rest in bed, and papain internally. The latter, the patient thought, lessened the tympanites, but the general condition became distinctly worse. The patient complained of great weakness and severe thirst. Water was vomited as fast as swallowed. The thirst was so great that in one night ten litres of water were drunk and vomited. Next morning the intellect was slightly clouded, there were atactic movements of the arms and legs, later general spasms. The symptoms grew worse. The urine, scanty before, was suppressed. The thirst and vomiting persisted. Coma came on, and irregular breathing, cyanosis, cold extremities, loss of reflexes, spasms, and vomiting continued until death ensued, two days after the change for the worse. Autopsy showed the greater curvature of the stomach at the level of the umbilicus; the lesser curvature formed an acute angle, the sides almost touching. The greater curvature measured 55 cm., the height from the fundus to the cardia 20 cm., the depth 14 cm. One centimetre below the pylorus was a stricture of the duodenum, caused by a ring-shaped scar. The duodenum above this and the pyloric part of the stomach were dilated; the duodenum between the stricture and the pyloric ring was the seat of a cicatrized ulcer, about 2 cm. in diameter, continuous with the constricting scar-tissue. The mucous membrane of the stomach was thin and smooth in the pyloric portion, unusually folded in the fundus, where there was slight *état mammelonné*, the two parts sharply separated by the fold of the lesser curvature. The muscular coat of the stomach was hypertrophic. The œsophagus was dilated and hypertrophic, the epithelium thickened in areas. The bladder contained 100 c.c. of urine, specific gravity 1020. There was a small amount of albumin, but no sugar. The other organs showed no alterations bearing on the case.

That the death was due to an intoxication of some kind was clear, and the author, showing that diabetes, cancer, and cholæmia were not present, in view of the enormous thirst and the failure of absorption, ascribes the fatal symptoms to lack of water in the blood and tissues and intoxication from the suppression of urine. It will be remembered that Kussmaul, in his earliest work on dilatation of the stomach, looked on lack of water from lessened absorption as of great importance, but afterward abandoned the idea. Von Jürgensen, however, is not willing to abandon the theory entirely, but would investigate each case in order to determine the precise

factors involved. He also suggests that stricture of the duodenum prevents the passage of the stomach-contents even more than obstruction of the pylorus.

Bolognini's Symptom in Measles.—KOPPEN has investigated this symptom, and not only has shown its worthlessness in diagnosis, but has also explained its cause. As described by Bolognini three years ago, the symptom is elicited as follows: The patient is placed on the back, the legs flexed. If then both hands are placed on the abdomen and the finger-tips used in palpation with increasing pressure, a feeling as of two rough surfaces rubbing on each other will be detected in circumscribed areas or over the whole anterior abdominal wall. With strong pressure or prolonged palpation the symptom disappears. Bolognini missed this only twice in two hundred cases. He found it in the earliest part of the prodromal stage, and it lasted until the end of the eruption. There were never symptoms of peritoneal irritation. The symptom was never found in healthy children, except among a few who had had measles a short time before. Koppen examined 316 cases of measles, some of them more than once, and with negative results in more than half. He found that the sensation was less like friction than like crepitation, as in emphysema of the skin, and that if the fingers were kept on the place when the sensation was discovered a coarser motion, evidently gurgling, would ultimately be felt and heard. In many cases, with the symptom there was diarrhœa, with foamy stools. On account of the partial absorption of the gas or water, or the expulsion of the flatus, the symptom does not always coincide with the condition of the stools.—*Centralblatt für inn. Med.*, 1898, No. 26.

SURGERY.

UNDER THE CHARGE OF

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A New Method of Tendinoplasty for the Dorsal Digital Tendons.—V. HACKER (*Wien. klin. Woch.*, 1898, No. 2) describes a new method which he employed in a case where there had been loss of the skin and of the extensor tendon of the index-finger, which was destroyed for a considerable distance, while the interphalangeal articulations were opened. The case came to him with a large granulating area covering the dorsum of the finger, and no sign of the tendon remaining.

The method employed was the utilization of the tendon of the index-finger in conjunction with the common extensor to bridge the gap. The extensor proprius indicis was divided at a point sufficiently near the carpus to enable him to reverse it and insert it beneath the periosteum and tendinous remains upon the dorsum of the last phalanx.

Its connection with the common extensor in the aponeurosis over the metacarpo-phalangeal joint insured its vitality, while it was united to it by a few stitches.

The skin defect was remedied by passing the finger beneath a bridge-shaped flap on the chest just below the xiphoid cartilage, holding it in that position till the flap had firmly united.

The result was all that could be desired, the function of extension was restored, and the skin flap united perfectly without adhesions to the tendon beneath.

The Treatment of Acute General Peritonitis Originating in the Vermiform Appendix.—DEANESLY (*British Medical Journal*, February 12, 1898) terms those cases general peritonitis where pus or septic fluid is found in the pelvic pouch, in both flanks, and among the small intestines as high as the navel, and when the inflammation is nowhere limited by firm adhesions. These cases demand immediate interference by operation to save the patient.

The author distinguishes three varieties according to their mode of origin : (1) The acute fulminating variety. There is an acute septic invasion, spreading with such rapidity that the greater part of the peritoneum is involved in twenty-four or thirty-six hours, and in which the virulence of the micro-organism is so great, or the resistance of the tissues so feeble, that the inflammation is not limited by the formation of durable adhesions among the surrounding intestines. (2) This variety follows the bursting of a localized abscess around the appendix by some mechanical cause, such as a blow or strain. (3) In this variety the onset is less acute and the early symptoms less severe. In fact, clinically, it appears to be an ordinary case of what used to be called typhlitis. There is little pain, moderate fever, a tender swelling in the right iliac region, and constipation, but no vomiting after the first day ; but the swelling, instead of gradually disappearing, or coming to the surface in the form of a localized abscess, becomes lost in increasing general distention, which begins in the lower part of the abdomen and spreads upward.

In the treatment of these cases the author believes that strict antisepsis is as essential as if no pus was present, as a mixed infection increases the danger. He employs the median incision in order to reach readily all parts of the abdomen, using a second incision over the appendix if it is found necessary. In ligating the appendix he forms a peritoneal cuff, ligates close to the cæcum, and then ligates the cuff over this, tying off the mesentery separately.

The removal of the appendix he considers to be an essential part of the treatment of cases of general peritonitis. In case of localized abscess it is generally held, and he believes rightly, to be unwise to disturb adhesions more than necessary, for fear of generalizing the infection. For the same reason, it is not advisable to prolong the search for the appendix after open-

ing and draining a localized abscess, and it is certain that leaving it in such cases is no bar to recovery. In general peritonitis, on the other hand, the only chance of averting a fatal result is the removal of the focus of infection and as much of the toxic products as possible. In other words, the appendix must be removed and all intestinal adhesions thoroughly separated in order to liberate and remove the collections of pus and lymph among the coils.

The abdomen he cleanses in all cases by means of sponges on holders, without the use of irrigation, which he has discarded.

Histological Study of the Varieties of Appendicitis.—Following the lines of his former work on this subject, PILLIET (*Le Prog. Méd.*, January 29, 1898) shows that the different forms of appendicitis may be classified according to the manner in which the follicles of that organ are affected by the process of inflammation.

Of calculous appendicitis he says :

1. The calculus is always composed of mucus and blood. Chemical analysis proves this and accords with the fact that mucus contains alkaline phosphates and carbonates. These calculi are therefore comparable to the calculi found in other organs of the body.

2. The appendicitis in itself is mild and prolonged. It is essential for the formation of calculi that the glands of Lieberkühn remain intact; that they are excited, but not destroyed. They can therefore coexist with recovery, though this form of appendicitis is, like all others, liable to acute exacerbations. It is generally, however, catarrhal in nature, in opposition to the acute ulcerating, perforating variety.

The so-called obliterated form of appendicitis is due to the destruction of the glandular tissues gradually and the formation of mucoid tissues in their place uniting the mucous membrane throughout, or it may be that the union takes place in the proximal portion only when its adhesion gives rise to the cystic variety. Gangrenous appendicitis is compared to the gangrenous form of dysentery, and is distinct from follicular lacerations.

Horseshoe Kidney Simulating Malignant Disease of the Abdomen.—OLIVER (*British Medical Journal*, February 26, 1898) reports an interesting case in which the symptoms exhibited by the patient pointed to malignant disease of the abdomen. A tumor was found in the median line that moved with respiration, produced pressure symptoms on the aorta, and seemed to have some connection with the symptoms of gastric disturbance displayed by the patient.

An exploratory incision showed a horseshoe-shaped kidney which rested upon the aorta and was slightly loosened from its median attachments.

The patient was relieved of all his troublesome symptoms by the operation. The author calls attention to the case as illustrating the fact that these abnormal kidneys must be taken into account in making a diagnosis in cases of tumors of the abdomen.

What Operation can do for Cancer of the Tongue.—In the study of one hundred and two cases of operation for cancer of the tongue in which he performed the primary operation, BUTLIN (*British Medical Journal*, Feb-

ruary 26, 1898) found that he had operated upon nearly an equal number in hospital and private practice; he also found, after getting returns from all but seven cases, that, besides the fact that the mortality was greater immediately subsequent to the operation in the hospital cases, the number of absolute cures with freedom from return, in some cases for thirteen years, and in all for over three years, was much greater in the private than in the hospital cases.

The number of deaths due to operation in the hospital group is no fewer than nine, while he only lost one of his private patients in whom there was marked involvement.

The number of such patients alive and free from disease more than three years after operation, or who died from other causes after the expiration of three years, was seven in the hospital group and thirteen in the other group, and there are nine others free from return after one year, but not over three years, while there are only two hospital patients who may prove cures. The percentage of cures in the hospital group of cases at the best is sixteen, while in the private cases it is twenty-six, with a chance of its being much greater.

The reason for this difference in results is found in the fact that the private patients are better educated and come for operation much earlier than do the others, which fact illustrates the great advantage of early operation.

The study of the cases which may be claimed as cured shows that the disease, in the large majority of them, was situated in the anterior two-thirds of the tongue. That is only what has been suspected and suggested, but hitherto he has not been able to prove it by a sufficient number of cases. But even some of the worst cases may be cured if the disease has not invaded the tonsillar and neighboring regions.

Among the private patients cured there was not one in whom the glands were removed, while in the hospital cases, of the seven five had the glands removed at the time of the operation or immediately subsequent to it by a second operation, and in four or five they were not only enlarged, but proved by microscopical examination to be cancerous. The author does not believe that the removal of the entire tongue is essential to a successful operation. The whole tongue was removed in only one of his successful cases. There is ample proof that removal of a portion of the tongue is sufficient to cure a considerable percentage of patients and to save a much larger percentage of cases from recurrence in the mouth. The removal of the entire tongue as a routine operation can be justified only by proving, as far as it is capable of proof, that a very considerable proportion of the persons who suffer from recurrence in the mouth would have been preserved from that recurrence in the mouth had the entire tongue been removed.

The author always aims at removing the cancer with three-quarters of an inch of apparently healthy tissue around it in every direction. Where the disease is on the border of the tongue his routine practice is to remove half the tongue to an inch behind the margin of the disease. In cases in which the disease is near the tip or forepart of the dorsum, the forepart of the tongue is removed.

The question as to the prevention of secondary infection of the glands of the neck is one of great moment, and yet its solution is full of uncer-

tainty. The author's tables show how frequently successful treatment of the cancer of the tongue has been spoiled by secondary affections of the glands which had appeared normal at the time of operation.

The expectant plan of treatment is full of uncertainty, as often the glands are so involved before it is possible to detect them that their removal is unavailing. On the other hand, it is difficult to say which group of glands will be involved, and consequently which should be immediately removed.

In spite of this uncertainty the author has become convinced of the necessity of a routine operation if cancer of the tongue is to be more successfully dealt with. He has employed during the past eighteen months the following operation, removing the entire contents of the anterior triangle of the neck: A very careful dissection of the triangle is made, so that the connective tissue and glands are all taken out in one continuous mass. Search is made between the muscles in front for one or two deeper-seated lymphatic glands, and the glands in front of the parotid gland and about the angle of the jaw are removed with the contents of the triangle. The submental and parotid glands are not so easily and certainly removed *en masse* in this operation as the submaxillary and carotid groups. This is done at a second operation, and not at the time of the excision of the tongue.

The Surgical Pathology and Treatment of Tuberculous Bone Disease.
—NICHOLS (*Boston Medical and Surgical Journal*, January 27, 1898) finds that many observations prove that tubercular disease of the bones and joints is caused by the tubercle bacillus.

Injuries of moderate severity favor the production of the disease.

In bones the disease begins in the epiphysis, and is more extensive than appears on gross examinations. Hence, in operation for removal of the disease, a considerable margin of apparently healthy bone must be removed.

Tuberculosis of the joints is generally, if not always, secondary to tubercular disease in the epiphysis of adjacent bone.

Abscess formation is due to extension of the tubercular process to the soft parts. The contents and wall of the tubercular abscess are different from those of infectious abscesses. Partial removal of the abscess wall is harmful.

Repair is caused by the formation of fibrous tissue, which replaces and partly encapsulates the tubercular tissue. Repair may be incomplete. Fibrous tissue may produce fibrous ankylosis, or the tissue may become ossified and lead to bony ankylosis.

Paraplegia in Pott's disease is rarely due to direct bony pressure. Usually the pressure is caused by tubercular peripachymeningitis. Rarely the pressure causes degeneration of the cord.

In regard to the surgical treatment, CABOT (*Ibid.*) says that, accepting the proposition that in these cases of tubercular bone disease we are dealing only with the localized focus, and therefore the operation is necessarily incomplete, and that nature must even afterward do much to accomplish the cure, it is plain how important it is to the surgeon to do all in his power to improve the patient's general condition and so to arrange his operation as to obviate a long confinement in bed, if possible.

The removal of tuberculous material must be as thorough as it can possibly be made, the bony focus being always hunted up and entirely removed.

Where possible, a considerable surrounding portion of healthy bone should be removed with it. This is usually accomplished in resections of the knee and elbow, and also in tuberculous disease of the hip where the process is confined to the head of the femur. When, however, the pelvic bones are also implicated, this is more difficult to accomplish.

When tuberculosis attacks bones in their continuity, where it is impossible to remove considerable portions of the bone without seriously interfering with the function of the part, surgeons usually resort to curetting; this, as shown by the remarks of Dr. Nichols, should be even more extensive than has been supposed, and should remove apparently sound tissue.

In these cases recurrence has been very frequent, while in the carpus and tarsus it is almost certain to occur. This is due to their isolation and lack of nourishment. It is usually well, therefore, to wholly remove any of these bones that are diseased. In the wrist the functional result after a removal of many of the carpal bones is not good, but in the ankle these operations, when undertaken in the young, give excellent results.

The success of treatment in cases of tuberculosis, other things being equal, is in inverse ratio to the age; that is, the older the patient, the worse the prognosis. The extent of operation required in a particular instance is often a question which demands great judgment.

In the after-treatment hygiene and absolute rest to the part, with even, gentle pressure applied over the area, the wound being properly drained, are the essentials. The author believes that iodoform has, in a measure, a specific effect upon tuberculous material. It seems to act by stimulating the tissues to an adequate resistance to the tuberculous material left after operation.

In speaking of the conservative treatment of tuberculous joint disease, BRACKETT (*Ibid.*), says: the conservative treatment depends upon the cicatrization in the tubercular process, which at some stages of the disease walls off the affected portion.

The object of the treatment is to protect the diseased joint surfaces from all such irritation as may be in its respective stages injurious until the process of repair is complete. These indications, which are met with in a diseased joint, must be treated in a most thorough manner, demanding a continuance of the utmost care for a long period of time, and may be considered under the heads of immobilization, avoidance of jar, traction, and the removal of weight. The immobilization must provide against both voluntary and involuntary movements; this is done by the use of the frame. Traction must be sufficient to overcome spasm and carried out in the line of the deformity, and must be continuous both when it is applied by weight during the recumbent and by the apparatus during the ambulatory treatment.

The necessity for the removal of pressure by weight-bearing lasts longer than either that of immobilization or traction. During the ambulatory treatment this is accomplished either by the use of crutches while the traction splint is worn, or, later, by the apparatus used as a walking splint, as an ischiatic crutch, transferring the weight to the tuberosity of the ischium.

This method of treatment is most successful in the early stages of the disease, though cases can be cured by persistent effort in the later stages.

This treatment has the advantage of procuring results with the least destruction of bone, and the possibility of a joint mobility is greater.

Splenectomy for Rupture Without External Wound.—An interesting and rare case of splenectomy is reported by BALLANCE (*The Practitioner*, April, 1898), in which the patient, a boy, fell from a tree a distance of ten feet, striking upon the abdomen on a pile of paving-stones. When admitted he was a little pale and collapsed, and obviously suffering much pain. There was great pain on palpation and percussion of the left hypochondriac region, but no pain or tenderness was found in any other part of the abdomen. There was no bruising of the skin or fracture of the lower ribs. A catheter was passed and urine and blood withdrawn, the latter being intimately mixed with the urine. There were also fractures of both forearms. The temperature was 97.6 and the pulse 70.

The following day the pulse-rate rose to 130, and the temperature to 100.8°. There was present great restlessness, respiration thoracic, shallow, and quick, *alæ nasi* moving. Abdomen slightly distended, immobile. No resonance anywhere. There was a large area of fixed dulness in the splenic and left lumbar regions.

Immediate operation was determined upon. The abdomen was found full of clots, the spleen ruptured. The spleen was removed, and the abdomen sponged out and closed. The patient made an uneventful convalescence.

For two days the temperature was 101° and the pulse over 100, but afterward both pulse and temperature were normal. For restlessness and sleeplessness morphine was given. During convalescence no serious symptoms supervened such as occur after the removal of the normal spleen in adults. About three weeks after the operation the lymphatic glands on the right side of neck, in both axillæ, and in the left groin were found to be obviously enlarged.

The symptoms produced by excision of the spleen in adults are : Progressive loss of strength and loss of weight. Extreme anæmia ; aspect withered and sallow. A daily rise of temperature. Increased frequency of pulse. Fainting attacks, with great pallor of surface. Headache, drowsiness, thirst, voracity. Diminished or increased secretion of urine. Gripping pains in abdomen and tenderness along the long bones. Enlargement of lymphatic glands. Certain typical blood changes. These symptoms become manifest some ten or fourteen days after operation, continue in great severity for a fortnight, and then a slow but perfect convalescence ensues.

The diagnosis of ruptured spleen is arrived at from the locality of the injury, the evidence of internal hemorrhage, and the large fixed dulness in the left flank.

The fixed dulness in the left loin and splenic region is not present in intra-abdominal hemorrhage from other organs, and is caused by the region being occupied by large quantities of clot. The dulness, therefore, cannot change with position, and is pathognomonic of this injury. The shock is at first very severe, and is due to the blow on the belly and the sudden escape of fluid into the abdominal cavity, as well as the great loss of blood. However great the initial collapse in uncomplicated splenic ruptures may be, experience warrants the belief that the bleeding will, at any rate for a time,

be arrested by the formation of clot in the ruptures and around the organ, and that in this way a rally will take place sufficient to justify the hope of successful surgical interference. The rhythmic undulations of size to which the spleen is subject possibly interfere with the continuity of hemorrhage from the organ and facilitate the formation of coagulum around it.

In the treatment the author advises excision. In his judgment any other plan is, even if feasible, dangerous. A patient with a belly full of blood is in desperate straits; the immediate danger to life is great, the operation must be completed in the shortest possible time, and no method less radical than excision can unequivocally be relied upon to arrest the hemorrhage.

In the treatment of the symptoms that arise after excision various remedies may be used, as fresh sheep's spleens lightly grilled, or extract of fresh spleen made with normal saline solution, red bone-marrow mixed with anchovy paste to make it palatable, arsenic, and cod-liver oil.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF
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Amaurosis Following Intranasal Operation.—DR. FRANCIS R. PACKARD, of Philadelphia, reports (*Medical News*, October 9, 1897) a case of temporary amaurosis of twenty to thirty minutes' duration, occurring suddenly in a man, aged thirty-six years, the day following the removal with the cold-wire snare, under cocaine anæsthesia, of a small piece of hypertrophied tissue from the anterior extremity of one of the middle turbinated bodies; and he refers to a number of similar cases reported by Ziem, Bresgen, and Thorner. In some of these instances examination of the optic field was negative, but in a number of them congestion of the optic papillæ with venous pulsation was noted. Packard calls attention to the anatomical relation between the venous, arterial, and nerve connection of the eyes and nasal passages. Incidentally he alludes to a number of other sequelæ of intranasal operations, some of them quite serious. [It is well for these examples to be occasionally laid before the profession and reproduced from time to time.]

Primary Lupus of the Larynx.—DR. EMIL MAYER, of New York, reports and depicts (*New York Medical Journal*, January 1, 1898) a case in a Russian man, aged thirty years. To this he adds a second case reported by Dr. Morris J. Asch in 1881, and still living in 1897, with a knotted stub of epiglottis, though death occurred before the end of that year. These cases are followed by a summary of other cases and the opinions of their reporters, with some general remarks on diagnosis, prognosis, and treatment, and a bibliography of a series from which the study has been made.

Intubation of the Larynx to Control Vomiting.—At the recent meeting of the British Medical Association (*British Medical Journal*, October 16, 1897) DR. CHARLES LYMAN GREENE, of St. Paul, Minn., read a paper upon "The Feasibility of Controlling Pernicious Vomiting by Means of Intubation of the Larynx with a Specially Adapted Tube." The tube is, in general, like the O'Dwyer tube, but differs in certain particulars. The speculation is a theoretical one, seemingly supported by experiments upon the lower animals, and apparently confirmed by a case recently under Dr. Schadle's treatment for chronic laryngeal stenosis by forcible dilatation. This patient was wearing a tracheotomy tube, and, during the passage of the large œsophageal bougie employed, the man makes the most violent efforts to vomit, but cannot expel any of the contents of the stomach, whether that organ be full of food or not.

Death after Thyroidectomy.—MR. F. T. PAUL, of the Royal Infirmary, London, reports (*British Medical Journal*, 1898, No. 1931) a fatal case of thyroidectomy, the only one in some thirty-six operations. It was one in which symptoms of Graves' disease accompanied a rather large parenchymatous goitre in a girl, aged fifteen years, who died two and one-half days after the operation.

A second case is mentioned in which severe symptoms occurred after operation on a woman, aged forty-three years, with rather chronic Graves' disease; but, fortunately, she recovered.

Foreign Body in the Nose for More than Forty Years.—The *Journal of the American Medical Association*, 1898, No. 24, reproduces from the French Congress of Otology and Laryngology an item in reference to a patient complaining of purulent rhinitis, in whom a canula was found in the left nasal passage into which it had been inserted forty-two years before and forgotten. A radiograph showed that the upper end of the canula was still in the nose. It was extracted through the inferior meatus, when all disturbance ceased at once.

Foreign Bodies in the Bronchi.—An exceedingly instructive case is narrated by DR. ALFRED AUSTIN LONDON, of Australia (*Intercolonial Medical Journal of Australasia*, 1898, No. 3), and forms a prelude to an admirable little article on the subject.

A boy, seven years of age, while taking a bath January 28, 1888, accidentally inhaled an ebonized stud, and for three days felt pain in the chest at a spot corresponding with the second right costo-sternal articulation. Despite this history, he was treated for more than a year for asthma, the story of the foreign body being discredited. In January, 1889, he had an attack of acute pneumonia of the right lung, commencing with a moderate hæmoptysis, and on the subsidence of the attack his expectoration became purulent, very offensive, and more profuse than it had been before.

March 2, 1889, he was admitted in the Children's Hospital, under the care of Dr. London, with great dyspnœa, frequent short hollow cough, and profuse fetid purulent expectoration, amounting to a half-pint in the twenty-four hours. Exploratory punctures with the aspiratory needle securing pus,

an inch or more of the fourth rib at the right upper axillary region was excised, and the pleural cavity opened, but there was no pus; the lung itself was then punctured, and still no pus could be reached. Some slight recent adhesions between the upper and middle lobes were then broken down with the finger, and this liberated a small quantity of pus. The finger reached the pericardial sac in the nipple-line, and the lung was felt to be retracted from the clavicle. While manipulating, Dr. Lendon felt what he believed to be the stud, with some lung tissue intervening between it and the finger, but subsequent digital exploration failed to detect it again. A drainage-tube was inserted and the wound sewed up. No sooner had the doctor left the hospital than the boy expectorated the stud in a violent paroxysm of coughing, during which he said he felt it in its old place in his chest. For a few days he had great dyspnoea and rapid pulse, but soon recovered, and has been in perfect health for several years, the right chest showing but little indication of the former trouble there.

Intolerance of Metallic Tracheotomy Tubes.—At a recent meeting of the Ohio State Medical Society (*Journal of the American Medical Association*, 1898, No. 21) DR. ALBERT RUFUS BAKER, of Cleveland, reported a case in which a patient, tracheotomized on account of dyspnoea due to paralysis of the posterior crico-arytenoid muscles, found great difficulty with metallic tubes, which would break, get out of repair, and be hard to clean, and frequently cause excessive granulations around the orifice. The metal tube was replaced by a soft rubber one, which was more satisfactory.

Fatal Dyspnoea from Hypertrophied Thymus Gland.—I. Under the title of "A Case of Spasmodic Dyspnoea," DR. J. S. BARNETT reports (*Lancet*, 1898, No. 3896) a case of labored breathing, with suprasternal and subcostal recession, locomotion of the larynx, and dilatation of the nares during respiration, which developed in a male child soon after birth. Tracheotomy was performed, and the child improved for several weeks, when he died during a prolonged attack of dyspnoea. The autopsy showed the trachea and larynx to be normal, and the thymus gland enlarged, the outlying lobules of the latter extending well into the root of the neck. It is thought possible that this may have caused pressure upon the recurrent laryngeal nerves, giving rise to spasm of the larynx, which was relieved by tracheotomy, the fatal termination being caused by further enlargement of the gland.

II. In the *Münchener med. Wochenschrift*, 1898, No. 11, DR. O. CLESSIN reports a sudden death due to a large thymus gland. A healthy child, two months old, was found dead in bed one morning, though it had seemed well at ten o'clock the evening before, and had never suffered from cough or dyspnoea. On post-mortem examination the lungs were found congested and showed petechial hemorrhages, with signs of slight bronchitis. There were petechiæ in the heart muscle also. All the other organs were normal, except the thymus gland, which was so much enlarged as to overlie about two-thirds of the heart, while it furthermore compressed the trachea to such an extent that a pin could scarcely be passed into the tube. The thymus was dark, full of hemorrhages, and contained a large amount of dark secre-

tion. The sudden death was attributed to acute swelling of the thymus, but the manner in which this arose was not clear. Friedleben was unable to cause such death by killing pups by strangulation, and Clessin has failed in attempts to produce it by tying the thymus veins.

Hemorrhage from the Internal Carotid Artery in Sequence to Tonsillitis. I. Hemorrhage through the Ear.—WALTER H. BROWN reports (*Lancet*, No. 3901, abstracted in the *Philadelphia Medical Journal*, 1898, No. 26) an instance of profuse hemorrhage from the right ear in a child five years of age recovering from an attack of follicular tonsillitis, the source of hemorrhage eluding examination. The meatus was packed with iodoform gauze, and four days later another hemorrhage, more copious than the first one, took place four hours after the removal of the packing. Under the belief that the hemorrhage was due to an erosion of the walls of the internal carotid artery, in probable sequence to some inflammatory change surrounding the vessel, it was deemed advisable to ligate the common carotid artery at once. This was done, and the child made a slow but satisfactory recovery.

Croupous Tonsillitis of Staphylococcus Origin, with Fatal Perforation of Internal Carotid Artery. II. Hemorrhage through the Nose and Mouth.—Under the title of "Septic Perforation of the Right Internal Carotid Artery, DRS. A. JACOBI and JAMES EWING, of New York, report (*Philadelphia Medical Journal*, 1898, No. 23) a case of croupous tonsillitis of staphylococcus origin with fatal perforation of internal carotid artery in a child whose age and sex are not mentioned, and whose clinical history was not learned until five months after death.

The child took ill two weeks before death with ordinary symptoms of croupous tonsillitis, with membranes on both tonsils. There were no Klebs-Loeffler bacilli. In a week the throat was pronounced clear, and the child much better. Then came on a severe chill, with rise of temperature, pain in the throat, dysphagia, and swelling of the lymph-nodes on both sides of the neck. Two days later there was considerable hemorrhage from the nares and pharynx, and two days after a second very profuse hemorrhage, "filling a bowl" with apparently arterial blood. Two days later a third hemorrhage. The nares were then plugged. Two days later the plugging was removed from the nares while the child was struggling, and a fourth severe and fatal hemorrhage occurred from the nares and the mouth. The autopsy revealed the fatal hemorrhage from an ulcerous perforation of the right internal carotid artery and the pharyngeal wall, while the condition of the internal jugular vein indicated that it or its branches were possibly the origin of the first hemorrhage.

The account of this case is followed by references to some similar cases of pharyngeal hemorrhage.

Pneumococci in the Throats of Healthy Persons.—At a meeting of the Société des Hôpitaux of Paris (*Philadelphia Medical Journal*, 1898, No. 21) BEZANCON and GRIFFON reported the result in their studies relative to the presence of pneumococci in the throats of healthy persons, having employed the serum of a young rabbit as a culture medium. They examined, bacteri-

ologically, the secretion from the tonsils of forty persons of all ages, living under the most diverse conditions, and found pneumococci in every individual. They believe that imperfect methods of investigation must have been pursued in previous observations in which pneumococci were found in a much lower proportion of healthy throats.

Chronic Nasal Catarrh.—The Chicago Medical Society is to be congratulated at having had read before it (*Journal of the American Medical Association*, 1898, No. 21), by DR. H. GRADLE, an admirably sensible paper upon "Classification of the Lesions Constituting the so-called Chronic Nasal Catarrh," the details of which would make too great a demand on our own columns, and so we cordially recommend the original to our readers.

Anomaly of Tongue and Palate.—W. M. HELSHAM (*Australasian Medical Gazette*, April 20, 1898; *Philadelphia Medical Journal*, 1898, No. 26) reports a case of absence of the soft palate, with a cleft tongue, in a child otherwise normal. The tongue was completely divided from behind to the extreme tip, where the two parts were united.

Gunshot-wound of the Pharynx.—DR. EMIL ARONSON, of Dallas, Texas, reports (*Journal of the American Medical Association*, 1898, No. 21) a case of injury of the pharyngeal cavity from the explosion of a gun. The upper incisors were struck first and knocked out. The projectile then changed its direction and passed through the oral cavity to become embedded in the muscles of the pharynx, where it lodged on one of the vertebræ, but nevertheless the patient for twelve hours did not believe that there was a foreign body in his throat. The bolt was removed with the aid of forceps and retractor, and was four and one-half centimetres long and weighed nineteen grammes.

Fatal Secondary Hemorrhage after Removal of Adenoid Vegetations.—DR. WALLACE PREBLE reports (*Boston Medical and Surgical Journal*, May 19, 1898; *Philadelphia Medical Journal*, 1898, No. 22) a case of fatal secondary hemorrhage on the eighth day after operation.

Leptothriza Mycosis of the Pharynx.—DR. MAX TOEPLITZ reports (*New York Medical Journal*, 1898, No. 1021) three cases of the disease out of dozens which he has observed during the last twelve years, and presents a comprehensive summary of the subject, followed by a copious bibliographical record. His own cases were cured by the sharp spoon and the electric cautery.

Urticaria of the Pharynx and of the Larynx.—I. In the *Philadelphia Medical Journal*, 1898, vol. i. No. 14, DR. JOHN MADISON TAYLOR, of Philadelphia, reports a "Case of Urticaria of the Pharynx Producing Grave (Edema of Glottis)." A lady, on attempting to sing shortly after dining, found herself unable to do so, without any well-defined reason. A forcible attempt to sing produced a sense of discomfort confined chiefly to the throat, and this finally grew so great as to produce exhaustion, apparently due to impending suffocation. When seen by the doctor shortly afterward, the face was livid

and cyanotic, the head thrown back, with gasping respiration and fluttering pulse, but without any mental disturbance. In some ten minutes or so urticaria appeared upon the skin and spread rapidly over almost the entire body, continuing for several hours, slowly subsiding in the next few days, and then occasionally recurring. The distress in respiration gradually diminished with the subsidence of the urticaria, and in a few days the patient was fully restored. The patient had been subject to attacks of severe urticaria twice before, but without complication on the part of the larynx.

II. DR. FRANK WOODBURY recently read a paper (*Philadelphia Medical Journal*, 1898, vol. i. No. 20) on "Urticaria of the Larynx Causing Asphyxia in an Adult." A merchant, subject to transient tumefaction of the face, had an attack after a mid-day lunch of bread, cheese, mustard, and beer and whiskey. In a short time he gasped, turned black in the face, and fell on the floor, where he remained for a few minutes apparently dead. Respiration being restored artificially, it was found that urticarial lesions were present upon the thigh and back. The patient seemed perfectly well again after a couple of hours' rest in bed.

[It is quite probable that the dyspnœa in this case was due to œdema of the larynx, as was inferred by Dr. Taylor in his own case reported above.]

Changes in the Larynx and in the Trachea in Cases of Leucæmia.—The *Philadelphia Medical Journal*, 1898, No. 23, summarizes from the *Münchener medicinische Wochenschrift*, April 19th, a report by OTTO BARNICK, of a case of a boy, aged thirteen years, who was the subject of leucæmia. He had attacks of severe dyspnœa, with croupy cough. Laryngoscopic inspection revealed great thickening of the ventricular bands, and infiltration of the whole upper portion of the larynx. The child died with severe dyspnœa, aphonia, and bleeding from the mouth and nose. On post-mortem examination it was found that the infiltration of the larynx and bands was due to a dense collection of lymphocytes in the submucous tissue. The capillaries, also, were distended with lymphocytes, and these cells were especially abundant in the interglandular spaces. The submucous tissue in the trachea was affected in the same way.

DR. OTTO BARNICK, clinical assistant in Prof. Habermann's Clinic at Gratz, contributes an elaborate article to the *Münch. med. Woch.*, 1898, No. 19. He reports three new cases in the clinical services of Professors Escherich and Kraus, the pathologico-anatomical material being contributed by Professor Eppinger, the best authority upon this subject. The lesions, as pointed out by Virchow, are lymphoid nodules, assimilating tubercles in different portions of the respiratory mucous membrane, with infiltration, which is sometimes so great as to require tracheotomy, which, in its turn, often merely postpones the fatal termination.

[This condition is unknown to most practitioners, and this article is therefore highly commended to those engaged in the study and practice of laryngology.—ED.]

OBSTETRICS.

 UNDER THE CHARGE OF

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Symphysiotomy.—LEPAGE (*Annales de Gynécologie*, March, 1898) reports eight symphysiotomies for contracted pelves. In all of these cases the degree of contraction was not a pronounced one, and the cases came within the recognized limit of the operation.

In his first case the child was lost through birth-pressure, the mother making a good recovery. The patient had broken her right thigh when a child, and the pelvis had suffered in consequence. The child perished from pressure upon the cord and pressure during extraction.

His second patient had lost two children by forceps extraction. In the present labor the symphysis was easily opened, the head rotated by Farabeuf's lever, and delivery was spontaneous.

His third case was a face presentation in a woman who had been pregnant eight times, and had lost several children by the use of forceps. After symphysiotomy the chin rotated under the pubes and the child was expelled.

In Case 4 fruitless applications had already been made with forceps before the patient came to the hospital. After symphysiotomy, the head was rotated by the lever and a living child delivered. The mother suffered from incontinence of urine for some time, and was threatened with phlebitis.

In Case 5 the mother had intestinal disorder and pain in one leg after the operation, but mother and child made a good recovery.

In Case 6 the forceps and lever failed to extract the child, and symphysiotomy was finally successful. The child, however, perished. A fracture of the skull was found upon autopsy.

The seventh operation was done upon a woman on whom symphysiotomy had been performed in previous labor. Some difficulty was found in opening the scar-tissue left by the first operation.

The eighth operation was done upon a patient who had a normal pelvis but a very large child. Both made a good recovery.

These cases illustrate fairly the legitimate field of symphysiotomy, and are of interest as clinical records.

In the same journal, April, 1898, PINARD reports seven symphysiotomies during the past year. There were 97 patients during this time in whom abnormality of the pelvis was recognized. Of these 77 had spontaneous births. Craniotomy was done upon 6, and abdominal section upon 3; the forceps was used three times, and symphysiotomy was done upon 7. These cases resemble the preceding. The forceps was used in tentative traction, and this failing, the symphysis was opened. Version was employed in some

cases. In several lacerations of the vaginal wall occurred, which were immediately closed by catgut stitches. Six of the patients had rhachitic pelvis; one an obliquely contracted pelvis. Two were primiparæ, five multiparæ, and one of these had the operation the second time. In three labor was ended by forceps, in four by version. Six women and all the children recovered. One woman died.

The patient who died was a primiparæ who had albuminuria. The wound was found united apparently, but on further study was discovered to be infected. In the peritoneum were found pure cultures of the colon bacillus. In the symphysis were streptococci, staphylococci, and colon bacilli, and in the uterus the same germs were present.

The Use of the Curette in Subinvolution During the Puerperal State.

—In the *Archiv f. Gynäkologie*, 1898, Bd. 55, Heft ii., KNAPP reports his experience in cases of subinvolution in which he has curetted the uterus during the puerperal state.

His patients were twelve in number. None of them had fever after childbirth, and there was no adequate cause for subinvolution which could be detected. All ordinary methods of securing involution had been faithfully tried. As indications for the operation, the following were considered sufficient: First, the retention of placenta or membranes within the uterus; second, the failure of other methods to secure involution; third, when the patient could not wait for prolonged involution to occur. Many working women could not afford to remain in the hospital a sufficient length of time without operation.

It is especially interesting to note that no adequate cause was found in all these cases for failure of involution. The exact manner in which the placenta was removed seemed to make no difference. Neither rapid nor slow labor seemed to influence involution. It was as common after premature birth as after labor at term.

The general health of the patient, however, had a marked influence upon involution. If the patient was strong and well, subinvolution rarely occurred. In primiparæ involution took a longer time, but was more complete when finished. In multiparæ it was not so perfect. Fever, excessive distention of the uterus during pregnancy, and all obstetric operations seemed to favor subinvolution. Repeated examinations during labor had the same effect. Especially important in securing good involution was the emptying of the bladder and rectum during the puerperal period. Where these were allowed to become distended, the uterus failed to contract. In cases where placenta or membranes were retained, the blunt curette was employed, but where hypertrophied decidua was present a sharp curette was used. The operation was based upon the size of the uterus, the condition of the cervix, and the condition of the lochial discharge. When the womb was large and soft, when the cervix was either partly open or tightly contracted and the lochial discharge was not red or serous, the case was considered a proper one for curetting. The occurrence of bloody lochia alone was not thought a sufficient cause. Knapp is accustomed to examine his patients ten days after labor, and if involution is not properly proceeding, curetting is performed. He is accustomed first to introduce a sound to determine the

size of the uterus, and observed that this is sometimes followed by contraction of the womb. He calls attention to the fact that the womb may be high in the abdomen and still involution have gone on well.

His cases all improved rapidly and were discharged cured six days after the curetting. Ergotin was given after the operation with good results.

Ectopic Gestation.—In the *Boston Medical and Surgical Journal*, May 12, 1898, SWIFT reports two interesting cases of ectopic gestation. In the first, a young woman recently married had symptoms of ectopic gestation, but no tumor could be found on vaginal examination. Membrane was discharged from the uterus, which Dr. Whitney pronounced characteristic decidua. On abdominal section, the right tube was found behind the uterus in such a position that it could not have been felt by vaginal examination. It contained an early embryo. The second case was that of a primipara who had an abdominal gestation with pseudo-labor and death of the child. Six weeks afterward Swift removed the fœtus and appendages. The patient made a good recovery. Whitney adds to this clinical report an interesting description of the decidual cells found in the first case and of the fœtus removed in the second.

Successful Antiseptic Precautions.—In the *Wiener klinische Wochenschrift*, No. 18, 1898, MARS describes the antiseptic precautions which he employs in Krakau. His results are excellent, a mortality of 0.4 of 1 per cent. for all cases in 700 patients, and a septic mortality of 0.28 of 1 per cent. His methods are practically to disturb the patient as little as possible. No douches before or after labor are given. The thighs and external parts are thoroughly scrubbed with soap and water and lysol. The hands of those who make examinations are very carefully cleaned, and the hand is always wet with antiseptics when the examination is made. Lacerations are closed immediately after labor. All operations or interference are done under strictly antiseptic precautions.

Cæsarean Section, with Transverse Incision of the Fundus.—SCHRÖDER (*Monatsschrift für Geburtshülfe und Gynäkologie*, 1898, Band vii., Heft 2) reports the case of a primipara with contracted flat pelvis, at full-term pregnancy. The patient elected Cæsarean section, with prevention of further conception. At operation the womb was opened by transverse incision of the fundus. The broad ligaments were ligated, the womb amputated, and stump covered with peritoneum and dropped. Bleeding was detected near the left sacro-iliac joint, with formation of retro-peritoneal hæmatoma. The peritoneum was incised, the clot turned out, and the vessel tied; bleeding promptly ceased. During recovery there was slight fever, tenderness over the stump, and infiltration of the tissues about the stump. This gradually disappeared, and recovery followed.

His next operation was for osteomalacia, and was a typical cœlio-hysterectomy, with intrapelvic treatment of the stump; recovery was delayed by a mild catarrhal pneumonia; the patient ultimately regained good health.

Case third was a rhachitic imbecile, with flat, rhachitic pelvis. This patient had been long in labor, and had been examined by a number of doctors and midwives. The child was dead, and the amniotic liquid dis-

colored. Cælio-hysterectomy was performed. Septic peritonitis developed, and the patient died. She had evidently been infected before operation.

Case four was a patient with flat, rhachitic pelvis, in whom the child was delivered by the transverse incision of the fundus. The uterus was closed by suture, and good recovery followed.

[In reviewing this interesting series of cases the formation of retro-peritoneal hæmatoma in the first is of interest. In the reviewer's experience, a similar complication arose after Cæsarean section, which followed injury to the vessels of the broad ligament by a clamp. The hæmatoma in this case was large, was limited by peritonitis, and disappeared after incising the posterior vaginal vault, washing out the cavity with salt solution, and packing with gauze. In this case the hæmatoma developed several days after operation, and with no other sign of bleeding.

In case third the strong probability of previous septic infection would, in our experience, have suggested embryotomy rather than Cæsarean operation.—ED.]

In the *Centralblatt für Gynäkologie*, 1898, No. 24, HEIDENHAIN reports two successful Cæsarean deliveries in patients having pronounced osteomalacia. In both the fundus was incised transversely, the incision afterward closed with catgut. In both patients the tubes and ovaries were removed, but the womb was left. The results were good, the osteomalacic pains growing less and the general condition improving.

From the Lemberg Clinic, SOLOWIJ reports (*Centralblatt für Gynäkologie*, 1898, No. 25) a Cæsarean delivery for osteomalacia in which the uterus was left and the tubes and ovaries removed.

[It is difficult to understand the reason for leaving the uterus after the tubes and ovaries are removed. The weight of modern opinion is distinctly against such a proceeding.—ED.]

Rubber Gloves in Obstetric Work.—DÖDERLEIN (*Centralblatt für Gynäkologie*, 1898, No. 26) has for some time caused rubber gloves to be used by all who make vaginal examinations during labor. The results have been most satisfactory: lower puerperal temperature, shorter recovery, and less and cleaner lochia. The advantages of the use of gloves are (1) they are impermeable; (2) they are easily sterilized in steam, boiling-water, or antiseptic solutions; (3) when wet in 1 per cent. lysol they are smoother than the hand; (4) they are not so expensive that they cannot be used. The gloves are boiled for half an hour and then placed in 1 per cent. lysol. The hands are first sterilized as carefully as possible, the gloves are filled with 1 per cent. lysol, and a glove is put on the hand used in examinations.

Does the Uterus in the Normal Puerperal State Contain Germs?—This much-discussed question is answered by BURCKHARDT (*Centralblatt für Gynäkologie*, 1898, No. 26), from the results of experiments in the Basil Clinic. He found that the uterus after labor is essentially an open wound, and that, like all open wounds, it is at first germ-free, and then contains bacteria.

In the puerperal state, at the eleventh or twelfth day, the uterine lochia is no longer sterile, and any unusual exertion which may alter the position of the uterus and interfere with its drainage is followed by slight absorption

and rise of temperature. In the greater number of cases bacteria gain access to the uterus through the cervix during the puerperal state, but they are not virulent germs, and if the uterus has not been wounded they occasion no trouble.

PÆDIATRICS.

UNDER THE CHARGE OF

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ASSISTED BY

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An Anomalous Case of Infantile Scurvy.—G. S. DE GROUTE (*Medical Record* April, 9, 1898) records a case of what seems by the therapeutic test to have been infantile scurvy, but presenting scarcely any of the classical symptoms of the disease. The child was a female, nine and one-half months of age, of good family history, and under good hygienic surroundings, never previously ill, and a picture of health. The first symptoms were pain in the right knee and hip, noticed only when certain movements were made, as when the nurse changed the napkin or made extension of the leg; neither joint was tender to pressure. Within twelve hours the pain was manifest also in the left shoulder and over the ribs, and soon after in the other limbs and the pelvis, though worse in the left arm and leg. There was only a slight swelling of the knee-joints; but no fusiform swelling of the lower extremities, no ecchymoses until late in the course of the disease, no changes in the gums.

The details of feeding were: Breast nursing for ten days; modified milk [no details stated] up to four and one-half months; then milk, barley-water, and water, of each two ounces; lime-water, one teaspoonful, sweetened to taste with milk-sugar and pasteurized. This last mixture was made stronger by increasing the milk and decreasing water until half milk and half barley-water; then the barley-water was made thicker. For a month before symptoms were noticed the child was taking at a feeding six ounces of this last mixture. As soon as the diagnosis was made pasteurization was stopped, and the juice of half an orange at first and later of a whole orange was given. Forty-eight hours after beginning orange-juice there was marked improvement, and in four days the child was well.

[Though the duration of symptoms is not given, nor the presence or absence of teeth remarked with the statement concerning the lack of changes in the gums, there is vague reference to the existence of ecchymoses late in the course of the disease, and it may be assumed from the context that the condition lasted some days, at least, before antiscorbutic treatment was begun. The rapid improvement is most suggestive of the correctness of the diagnosis. Infantile scurvy is so generally understood by medical men at the present

day, that incipient cases are frequently met, recognized, and cured before gross changes have taken place. In several cases in which we have had reason to be on the watch for scorbutic symptoms we have seen sponginess of the gums appear and yield to treatment all within a week, without any of the grosser symptoms having time to manifest themselves.]

The Duration of Immunity Conferred by a Single Injection of Diphtheria Antitoxin.—F. GORDON MORRILL (*Boston Medical and Surgical Journal*, March 3, 1898, p. 193), whose experience in immunizing a large number of children in the Boston Children's Hospital is already well known, makes the following statements in concluding a paper on this subject: Immunity in any given case, of no matter how thorough exposure to diphtheria, may be conferred for at least ten days by the injection of a small dose (100 to 250 units) of serum, provided it is given twenty-four hours previous to actual infection. A larger dose (250 units for a child of two years, up to 500 units for one of eight or over) will confer safety for three weeks—or, to be a little more conservative, let us say, twenty days—under similar conditions.

No harm will result from the treatment in a vast majority of cases of *sick* children, and probably in no case of a healthy child, provided the serum used is up to the present standard of purity.

The Treatment of Epidemic Cerebro-spinal Meningitis with Corrosive Sublimate.—DINAMI (*La Pediatria*, November, 1897) has employed with success the method of Dazio in treating meningitis with hypodermatic and intravenous injections of mercuric chloride. The patient was a girl of seven years, seized suddenly with high fever and intense cephalalgia. For five days the temperature ranged between 102° in the morning and 104° to 105° in the evening. There were general prostration, arrhythmia of pulse, scaphoid belly, vomiting, deafness, and photophobia. After the sixth day the fever became intermittent in character, ranging from 97° in the morning to 104° or 105° at night, the general state being quite good during the apyrexia, but with the rise of temperature coma being present. On the seventeenth day, after failure of treatment with calomel, wet cups, cold applications to the head and neck, opiates, antipyrin, phenacetin, and other remedies, one centigramme of sublimate was injected beneath the skin. After the first injection the temperature fell half a degree, and the headache became less intense. After the fifth injection fever and headache disappeared completely. Convalescence was slow, but the child was able to leave her bed fifteen days after the cessation of fever. The power of walking was not regained for a month, and during convalescence hallucinations were present. Despite the use of iodides the deafness persisted.

Noma in the Course of Pertussis.—An instance of noma complicating pertussis, one of the rarest of the associations of *cancrum oris*, is recorded by SIMONINI (*La Pediatria*, November, 1897). The patient was a girl of three and one-half years. Toward the end of a severe attack of pertussis lasting three months, the parents noticed dribbling of saliva and detected a swelling of the gum over the right canine and premolar teeth. Two days later the disease had spread to the lip, the mucous membrane became livid and covered

with grayish vesicles, which ulcerated; the teeth became loose and the breath fetid. The child was first seen on the twelfth day of the disease. The right labial commissure was totally destroyed for an extent of two centimetres. Within the mouth the gangrenous lesion was more extensive; two teeth had been lost, the canine and premolar first involved; the mucous membrane was spongy, sanguinolent, and black; the frænum of the tongue was ulcerated. The temperature was 100.4°. Cure followed the use of the actual cautery, aided by local antiseptic applications.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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AND

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Aerated Butter.—The unequal quality of Irish butter, due to the very different degrees of skill and care, we might add of cleanliness, in its preparation, is well known in the markets, good and bad strata not infrequently being met with alternating in the same cask. To overcome this a company has been formed in Dublin to work a process substantially the same as that of R. Andrews' patent (No. 4622 of 1894), much used for the purification of other fats. Rancid butter is emulsified with buttermilk at a regulated temperature, and is then subjected to the continued action of a much divided current of warm air, which carries off the volatile acids to which the rank taste and odor of bad butter are due, non-volatile impurities being at the same time washed out of the fat. After the two or three hours required for this process, according to the quality operated on, the temperature is lowered, and the purified butter is repeatedly washed with cold water, the product being perfectly sweet and well granulated, with an agreeable flavor; in fact a really high-class article. Dr. Emerson Reynolds, F.R.S., Professor of Chemistry in Trinity College, Dublin, testifies to the unqualified success of the procedure in transforming bad butter into a wholesome and perfectly unobjectionable food.

Tuberculosis in Fish.—MM. DUBAR, BATAILLON and TERRE communicated to the Academy of Medicine an observation, as yet unique, of the occurrence of tuberculosis in a cold-blooded animal. The circumstances were peculiar, constituting, in fact, an undesigned experiment. The dejecta and sputa of a woman suffering from advanced pulmonary and intestinal tubercle, having been for some time regularly emptied into a pond in which were large numbers of fine carp, many of the fish were found swollen and dead, and on examination their livers, spleens, and other viscera were seen to be stuffed

with tubercle bacilli. Healthy fish fed with this tubercular material, or with that from tuberculous guinea-pigs and fowls, succumbed in like manner within three or four weeks, but the fish tubercle proved quite innocuous to warm-blooded animals. The obvious conclusions to be drawn from these facts are that fish are even more susceptible to tubercle than rodents, etc., and owe their exemption to the conditions under which they usually live; that if man be as resistant to fish tubercle as other warm-blooded animals have shown themselves to be, there is little danger from the consumption of diseased fishes, which, moreover, are not likely to be met with under ordinary circumstances, since the effect of the cultivation of the bacilli at the low temperature of the fish's body has been the attenuation of their virulence, but whether they would regain it in time in the warm blood of a higher animal has yet to be seen; very probably they would.

Tetanus in "Made Soil."—Ever since 1884, when Nicolaier, following up the discovery of the bacillus of tetanus by Carle and Rattone in the dust of old buildings, found it in the soil of gardens, stable-yards, etc., it has been known that the natural habitat of the bacillus is in the outer world, whence it gains access to the body by the inoculation of "dirt" in which it is already present; and that the frequency with which tetanus follows wounds of the sole of the foot and the palm of the hand is owing simply to the fact that such wounds are specially exposed to the entrance of earth and dirt from the conditions under which they occur. But, as might have been expected, "made soil," as it is called, the mixture of house refuse, street sweepings and mud, with ashes and other materials, organic and inorganic, has been found by Dr. K. Kratz to be above all others rich in these bacilli, and therefore specially dangerous. In the course of an exhaustive investigation into the chemistry and bacteriology of the soil composing the "tips" of the municipal dust-yards at Giessen, he found that the injection of the watery extract of such soil into mice was invariably followed by death from tetanus, though negative results only were obtained in control experiments with the earth from an adjacent grass meadow. The importance of this observation is obvious when we consider the extent to which such "made soil" is used in building operations for filling up natural depressions or those produced by the excavation and removal for sale of good sand and gravel, and that the sites of dust-yards, when, through the growth of towns, they become surrounded by houses, usually pass into the hands of the builder, the authorities seeking others more remote.

Deaf Mutism.—Holding that all philanthropic effort having as its aim the amelioration of the material and social conditions of the community comes within the scope of public health, it is with mingled feelings that we read the report of the recent "Congresso dei Sordomuti" at Milan. If in Italy the deaf mute have been relegated by the statute law to the category of idiots and imbeciles, incapable of exercising civil or political functions, his position in Great Britain has been a peculiarly anomalous one, since without any disability or exemption he has either been left uneducated, or has received an instruction fitting him for intercourse with such only as were afflicted in like manner, narrowing his capacities and tending to the perpetu-

ation of deaf mutes through intermarriage. In Germany the method of finger language is quite obsolete, having everywhere given place to that of teaching the deaf mute to emit vocal and articulate utterances, which he does not hear, and to interpret by sight the lip-movements of those possessed of speech, a system which, notwithstanding its great and obvious advantages, has made but very slow headway here. The most interesting feature in the Congress was the object-lesson presented of the capabilities of the deaf mute for taking his part in social and public life, if only the exercise of his power and the growth of his intellect be not stifled by neglect. Infants and children chattered according to their abilities, one or two deaf mutes took part orally in the discussion, a vote of thanks was moved in a graceful speech by another, and the pupils of one of the forty or fifty institutions in the kingdom, 100 strong, after going through some well-executed evolutions sounded round after round of loud "evvivas!" It is remarkable that the only country in which these unfortunate persons are deprived by the law of their civil rights should be that in which most has been done to fit them to take their place among educated citizens.

Cholera-infected Food.—According to the *Pharmaceutical Journal* of July 31 and August 7, 1897, a number of rabbits that had been inoculated with cholera and other pathogenic bacteria were taken from the Aubervillier's Hospital in Paris by thieves, who carted them about the suburbs of Clichy and St. Ouen, and sold them at low prices. The police succeeded in finding several of the people who had purchased, but only one family that had eaten them. In this case no trouble of any sort was experienced.

Disinfection by Alcohol.—According to DR. F. EPSTEIN (*Zeitschrift f. Hygiene und Infektionskrankheiten*, xxiv. p. 1), alcohol is strongest in disinfecting power at 50 per cent., from which point in either direction its power diminishes. Absolute alcohol has no power at all. Chemicals which are more or less efficient in aqueous solution lose their disinfectant property in strong alcohol; but corrosive, carbolic acid, lysol, and thymol have greater effect in 50 per cent. alcohol than in water.

Widal's Test for Typhoid.—The expectations raised some few years ago, when Widal announced his discovery that the serum of a patient suffering from typhoid fever, added to a broth culture of the bacillus of that disease, caused the bacilli to agglutinate in groups or masses, to lose their mobility, and to die, seemed doomed to disappointment by the subsequent observation that the same phenomenon might be produced by the serum of other febrile diseases. It was true that the positive results, while apparently constant in enteric fever, were exceptional in non-typhoid cases, but the exceptions were numerous enough to cast a doubt on each single observation and to deprive the test of all certainty and diagnostic value. It was next found that in cases of true enteric fever the delicacy of the test was enhanced by the use of a larger proportion of the culture fluid, or, still better, by the dilution of the serum with water or broth. Widal himself adopted dilutions of 1:10, with better results in cases of true enteric fever, but without eliminating erroneous conclusions in others. Subsequent observers, however, ascertained that

by carrying the dilution further a point was reached at which the serum of other diseases ceased to react, though the activity of that of enteric fever was unimpaired.

MESNIL DE ROCHMONT, from a large number of observations, came to the conclusion, fully confirmed by others, that the highest dilution in which a positive reaction could be obtained in any non-typhoid case was 1 : 25 ; and consequently 1 : 30 was given by Gruber and Stern, 1 : 40 by Förster and Kühnau, and 1 : 50 by Sklower and Scholtz, as results which would effectually exclude the possibility of error. Scholtz, having verified the observations of previous observers, especially Fraenkel, Stern, and Förster, and investigated exhaustively several hundred cases of enteric fever and others more or less closely simulating it, lays down the following propositions :

1. That in cases of true enteric fever dilutions of 1 : 50 will generally afford positive indications within the first, and always during the second week, the energy of the serum increasing as the progress of the disease.
2. That the serum retains this property for many months or years ; in fact so long as immunity, with which it is in some way connected, persists.
3. That apparently positive results are afforded in a certain proportion of febrile diseases other than enteric, but that this occurs only when the serum is comparatively concentrated, and never in dilutions of 1 : 30 or more.
4. That if, in the case of a patient suffering from a febrile disease of a doubtful character, a positive result be really due to the fact of his having passed through an attack of typhoid some years previously, a second examination made after the lapse of a week will not show the increase in the activity of the serum which would have been observed had the actual illness been genuine enteric, of however mild a type. The degree of dilution which such cases will bear depends chiefly on the time that has elapsed since the attack ; in those of very recent date it may be as high as in cases of present enteric fever, but it will remain stationary through the whole course of the actual illness.

Thus, among one hundred cases of non-typhoid febrile disease, Scholtz obtained apparently positive results in nineteen with dilutions of 1 : 5 ; in eleven of these with 1 : 10 ; in seven with 1 : 15 ; in three with 1 : 20 ; and in one a very faint reaction with 1 : 25 ; whereas, in as many of true typhoid, he never failed with dilutions of 1 : 50.

Examining the blood of six persons who had suffered from enteric fever at periods ranging from eight to fifteen years previously, he obtained positive results in all with dilutions of from 1 : 25 to 1 : 12 ; and in some of more recent date with 1 : 40, though in perfect health at the time.

The highest dilution with which he observed a fallacious positive result in non-typhoid febrile attacks was, as stated above, 1 : 25, or a distinct reaction with 1 : 20 ; whereas, on the other hand, the lowest dilution with which the reaction was lost early in the course of a mild attack of real typhoid was 1 : 45, and in this a later observation was successful with 1 : 50, the difference between 1 : 25 and 1 : 45 giving a margin wide enough to exclude all risk of error.

The test is equally available after death, and in one case with no characteristic symptoms during life, a post-mortem application gave a positive result with 1 : 50, which was confirmed by the serum revealed at the autopsy.

The procedure he recommends is to keep the broth culture of the bacilli for the six hours preceding the examination at a temperature of 37° C., so as to secure their active growth; to use as a diluent a simple sterilized broth, and, rejecting all elaborate apparatus, to employ only a capillary pipette graduated to measure $\frac{1}{100}$ c.cms.

He begins by making a 1:10 dilution of the serum and adding it to an equal volume of the culture. If the result be negative, nothing more is needed; but if positive, he tries the effect of 1:40 and 1:50, the indications of which, whether positive or negative, are to be taken as conclusive, unless there be grounds for suspecting that the reaction may be owing to a remote attack, or that the disease be not further advanced than the first week; in either of which cases the examination should be repeated a week or so later.

Microbe of Acute Rheumatism.—The frequent association of acute rheumatism or rheumatic fever (neither name being satisfactory in the light of modern views as to the etiology and relation of the so-called acute and chronic rheumatism) with cerebro-spinal meningitis, now acknowledged by all to be a bacterial and infectious disease, and with tonsillitis, many forms of which are certainly so, has for some time suggested the possibility of its being, like malaria, parasitic, though not communicable.

Pierre Achaime, so long back as 1891, in a communication to the Société de Biologie, described an organism which he had found in the blood of a man suffering from rheumatic fever with cerebral complications, and which he believed to be pathogenic, giving it the name of *Thirolaix Achaïmii*. In the *Annales Pasteur* of November, 1897, he states that he has since been able to identify it in eight cases, and that it has been observed also by Lucatello at Genoa and Riva at Parma in this disease, but in no other. In two fatal cases he found it in enormous numbers in the cerebro-spinal fluid, where it was present as an almost pure culture; but that its presence in the blood of the living subjects could be demonstrated only by artificial cultivation in a mixture of bouillon and milk maintained for eight to ten days at temperature of 37° C. under anaërobic conditions. Its form varied considerably with the culture media employed, but it grew better in liquids than in solids and at a temperature of 35° to 38° C., the extreme limits being 25° and 40° C.

Growth of Bacteria in Sterilized Milk.—Milk when drawn from the udder of a healthy cow is perfectly sterile, and all the so-called "spontaneous" changes of souring, curdling, and putrefaction are the results of the introduction of successive contingents of bacteria, beginning with *B. coli*, in the process of milking, which multiply until in the shops they number tens of thousands or even millions in the c.cm. Sterilizing the fresh-drawn milk, besides destroying any pathogenic germs that may chance to be present, delays the souring until after the vessels have been opened, but recent observations of SCHOTTELIUS show that it does more, and that the proliferation of bacteria proceeds with but a tenth part of the rapidity exhibited in fresh unboiled milk under identical conditions; at any rate, this was the case with those of diphtheria. He added 1 c.cm. of a bouillon culture to 2 c.cms. of (1) fresh milk drawn from the cow with every precaution, and therefore sterile, (2) sterilized milk, and (3), by way of comparison, sterilized bouillon; one

set of tubes having been kept at the ordinary temperature of the room, and the others at that of the body; the enumerations were made at the end of six hours. The exact number of bacteria introduced is not stated, but uniformity was secured by the inoculations being performed simultaneously from a culture that had been well agitated.

The results were: Raw milk, 21,280,000, at 15 per cent.; 50,160,000, at 37 per cent. Bouillon, 7,600,000, at 15 per cent.; 18,240,000 at 37 per cent. Sterilized milk, 2,200,000, at 15 per cent.; 6,080,000, at 37 per cent.

Alcohol in Milk.—The effect of brewers' grains, distillery swill, ensilage—in short, of fermented fodder of any kind—on the milk of cows in rendering it prone to turn sour within twelve hours and to set up gastro-intestinal disturbance in infants is so well known that the use of such foods is expressly prohibited in the contracts between the great dairies, the condensed-milk companies, etc., and the farmers from whom they obtain their supplies; but whether alcohol ever passes over as such into the mammary secretion of the cow or of the human female is a point that has been denied on negative and maintained on insufficient evidence. A recent observation by H. WELLER has, however, proved the possibility of such a result beyond question, for he was able to recover 0.96 per cent. of alcohol from the milk sent out from a dairy owned by the proprietors of a large distillery, where, in addition to cake and other fodder, the swill, containing 5.9 per cent. of alcohol, or as much as is present in strong ales, was given to the animals, though in what quantity is not stated. The milk examined was perfectly fresh and otherwise of normal composition, without a trace of souring. The specific gravity was 1.0335, the total solids 13.307, and the fat 3.79 per cent. It had, however, a peculiar harsh taste, of which the consumers complained, and which Weller found to be due to a flocculent substance present in the distillery waste and in the milk, the nature of which he does not seem to have taken any means to determine.

Transmission of Infectious Diseases through the Air.—DR. EDUARDO GERMANO, continuing his researches on this subject, the first of which were referred to in the March number of this JOURNAL, finds that the diphtheria bacillus (*Zeitschrift f. Hygiene und Infektionskrankheiten*, xxv. p. 439) withstands long drying in membranes, tissues, and dust, even when the drying process is assisted by sulphuric acid, and that its resistance is greater according to the amount of the enveloping material which retards oxidation. When completely dry it preserves its full virulence up to the time it dies. He concludes that the air can disseminate the bacilli in an active condition in the form of dust. As to erysipelas, pneumonia, and other streptococcus infections, he finds (*Ibid.*, xxvi. p. 66) that the resistance of streptococcus to the drying process, while varying according to the method followed and to the enveloping material, is always high, and may last a number of months, and that the air may be credited with an important share in the transmission of infections. The diplococcus in general can bear drying for a long time, but some varieties show but little resistance, and, as a rule, it lasts better dry than moist. Its duration of life is not affected by the rapidity of the drying process with medium temperature. While it has not the resistance shown by the streptococcus, its dissemination through air must be regarded as possible.

His concluding paper (*Ibid.*, xxvi. p. 273) deals with cholera, plague, and epidemic cerebro-spinal meningitis. Contrary to the views of Pettenkofer and his school, who hold that air is the only medium for disseminating cholera, and that water and moisture have no important part in the process, his experiments lead to the conclusion that the cholera organism retains its virulence only so long as it remains moist, and dies quickly on drying, and the more so if the process is hastened. In his experiments he employed dust impregnated with bouillon cultures, and sterilized feces, which he infected with the organism and then mixed partly with fine sand and partly with brick-dust. He places the cholera organism in the class of bacteria which show least resistance to drying, and concludes that dissemination by air is most highly improbable. His work on the bacillus of plague agrees in results with that of Kitasato and of Wilm. It does not withstand drying, but lives a long time in the moist condition. It remains active fairly long when dried on cloth, perhaps because then complete drying requires a long time, and thus may be explained the danger of infection which is recognized to exist in infected clothing. His experiments with the diplococcus of epidemic cerebro-spinal meningitis confirm the conclusions of Jäger as to its resistance to drying. Jäger found the organism in an active condition in a handkerchief six weeks after use by a patient sick with the disease. Germano shows that it belongs to the class of bacteria which show the greatest possible resistance to drying, whether the process is quick or slow or assisted by the action of sulphuric acid, and concludes that it may without difficulty get into the air in the form of dust, and thus spread the infection.

DR. MAX NEISSER (*Ibid.*, xxvii. p. 175), working in the same line with an apparatus of his own design, which establishes a constant aspiration current of dusty infected air, disagrees with Germano in his conclusions that the pneumococcus withstands drying, inasmuch as while mice inoculated as controls with infected dust died from the infection without exception, negative results were obtained in every one of twenty-four inoculations with dust that had been disseminated through the apparatus in the current of air. His experiments with various organisms led him to conclude that dust-infection is impossible with the organisms of diphtheria, typhoid fever, plague, cholera, and pneumonia, but possible with staphylococcus pyogenes aureus, B. pyocyaneus, B. anthracis, B. tuberculosis, and meningococcus.

The Typhoid Bacillus and Buttermilk.—DRS. EUGENE FRAENKEL and J. KISTER (*Münchener medicinische Wochenschrift*, February 18, 1898), having reason to believe that the unusual amount of typhoid fever at Hamburg during the summer of 1897 was due in part to infected buttermilk, undertook the study of the question whether the *B. typhosus* can exist in that fluid, concerning which point there is more or less of conflicting testimony. Obtaining some samples, they first investigated the number and identity of the contained bacteria, and learned that while the number varied widely, the species were always about the same. Finding no pathogenic organisms, they sterilized specimens in test-tubes a half hour a day for three days, then planted the typhoid bacillus in them and kept them at different temperatures: on ice, at 22° C. and 37° C. Loops were taken from each from time to time and planted, and all yielded positive results. The specimen kept at room-

temperature was under observation nine days; the others were not examined after the third. Then, specimens of fresh buttermilk containing all its bacteria were planted and kept under the same conditions, and from them the same results were obtained. Yet there was this difference, that there was always a diminution in the number of the pathogenic organisms, and this was more marked, and sometimes very rapid, with increasing temperatures.

How the Color of Drinking-water Due to Humic Substances may be Influenced by Iron Compounds.—W. SPRING (*Chemisches Centralblatt*, 1898, i. 410) advances as a result of some observations on the color of drinking-waters an explanation of the influence of iron salts. Mixing brown peaty water with dilute solution of ferric salts, it will be noticed that the color is at first dark, but under the influence of light becomes less and less so, and meanwhile a precipitate settles out. The humic substances are oxidized and unite to form insoluble compounds with metallic oxides. In this process the ferric are reduced to ferrous compounds having insignificant color, but the latter are soon again oxidized to ferric, and then resume the separation of the organic coloring. He likens the function of iron in the purification of water to that of the hæmoglobin of the blood.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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Cancer of Œsophagus with Involvement of Heart and Lung.—BUREAU (*Bull. Soc. Anat. de Paris*) reports the above condition in a man, fifty years of age, emaciated and cachectic, with pain on swallowing, and vomiting, which only once showed the presence of blood. Later a pleurisy developed and 500 c.c. of fluid were withdrawn. Sputum became fetid. Tachycardia was observed, the pulse on one occasion being 160. Post-mortem examination showed a constricting cancerous growth of the Œsophagus with ulceration and perforation into the middle lobe of the right lung. The Œsophagus was adherent to the left auricle of the heart with projection of the growth into this cavity, and there was a formation of cancerous nodules the size of a pea on the endocardium. The muscular fibres of the heart were atrophied and also infiltrated with cancer cells. The left inferior pulmonary vein was compressed by the growth, as was also the right pneumogastric nerve. Histological examination of the growth showed it to be an epidermoid cancer.

The Pathology of Tabes Dorsalis.—In an exhaustive monograph on the pathology of the spinal cord changes of locomotor ataxia, REDLICH presents

a critical review of the literature of this subject, and adds much of interest derived from personal studies of his own, made for the most part in the laboratory of Professor Obersteiner (*Die Pathologie der tabischen Hinterstrangserkrankung ein Beitrag zur Anatomie und Pathologie der Rückenmarkshinterstränge*: Jena, 1897: G. Fischer. Pp. vi. 205).

The work is divided into four parts, devoted respectively to the normal anatomy and histology of the posterior columns, to their pathological changes in locomotor ataxia, to the etiology of locomotor ataxia as gathered from statistics and from clinical studies, and to the pathogenesis of the lesion in the posterior columns incident to the disease.

His studies of the distribution of the structural changes lead Redlich to renounce the theory, advanced by Strümpell, that the lesion of tabes is a system degeneration. The opinion of Flechsig, that it follows the course of the developmental tracts, is also denied, and it is maintained that the first evidences of degeneration are to be found in the posterior roots, and that the degeneration is rather segmental than systemic in its occurrence and distribution.

The part of the posterior roots which seems to be earliest affected is the region of their union with the spinal cord. It is maintained that this region is more liable to injury because of certain peculiarities of its position, and in support of this view the acute angle at which many of the lower sensory roots unite with the cord, and the opportunity thereby afforded for constriction of the roots by the pia, are brought out. Actual meningitis is believed to be the cause of the local degeneration in comparatively few cases, as are also pressure from inflammatory lesions in the neighboring bones or from changes in the bloodvessels at the point of entrance of the roots into the cord. Nor do there appear to be primary changes in the ganglia of the posterior roots, nor in the peripheral nerves. Thus, while Redlich is convinced that the lesion of tabes has its origin in the posterior roots just at their point of union with the cord, and that this is anatomically a *locus minoris resistentiæ*, he is unable to decide what is the precise exciting cause of the change.

As regards a more remote etiological factor syphilis is noted as having been present in 65.2 per cent. of the men (seventy-two), and in 23.4 per cent. of the women (thirty) studied by Redlich. In a few cases other infectious toxic conditions seemed to have taken the place of syphilis as an etiological factor.

The monograph is handsomely illustrated by a number of well-executed plates, and will repay a careful perusal.

Experimental Studies in Cardiac Arrhythmia.—M. HEITLER (*Wiener klin. Wochenschrift*, 1898, Nos. 3 and 8). Arrhythmia is a recognized symptom of cardiac disease, but its exact significance has only recently been investigated. The author has made experiments upon curarized dogs, the pulse being recorded in the usual manner upon the kymograph. It was first found that any mechanical irritation of the heart would produce arrhythmia, and that special cardiac regions were more susceptible; for example, the longitudinal sulcus, especially its upper third. Arrhythmia was more intense if the irritation was applied during systole than diastole. Cutting the vagi had no effect upon the arrhythmia following irritation. The lightest touch of the visceral pericardium caused as much arrhythmia as deep stimulation. Cocaine applied to the pericardium overcame the irritation and no arrhythmia resulted. Seizing

the heart with pincers caused arrhythmia at the first touch and upon removal, not for the entire period. Irritation of the endocardium produced arrhythmia in the same way as the pericardial irritation. This was proved by passing a tube with a sliding rod inside into the left auricle. The endocardium was irritated by moving the rod back and forth, without producing any lesion of the cardiac walls or at most only a slight erosion. Irritation in the neighborhood of the valve produced greater arrhythmia than irritation of the deeper parts. Both sides of the heart react alike. Myocardial irritation was studied by thrusting electrodes varnished to the tips into the heart-wall. No arrhythmia resulted from the mechanical irritation of the electrodes, and it was only upon using a very powerful electric stimulation that arrhythmia resulted, and here the contractions as registered by the sphygmograph differed markedly from those of pericardial and endocardial irritation. Mechanical irritation of the myocardium failed completely in producing arrhythmia. A piece of the heart-muscle could be snipped out without producing arrhythmia.

Primary Cancer of the Appendix.—MOSSE and DAUNIC report, in the *Bulletin de la Soc. Anat.*, November, 1897, a case occurring in a woman fifty years of age, who died of cardiac disease. The appendix floated freely in the peritoneal cavity; was 4 cm. in length, and 4.5 cm. in circumference, and cylindrical in shape. On transverse section the muscular layers could be seen enclosing a hard mass, within which was a narrow canal opening freely into the cæcum. The tumor did not project at all into the cæcum, but was limited to the appendix. Histological examination showed the muscular layers for the most part normal, in places separated by infiltrated epithelial cells forming small islands. The peritoneal coat was normal. In the central part of the tumor, near the central canal, were seen remains of the mucosa and of Lieberkühn's glands. The latter had for the most part undergone cancerous transformation and were probably the origin of the neoplasm. In places the neoplasm presented the appearance of cylindrical-cell cancer. This condition of the appendix, with absence of cause in the cæcum, lymph-nodes, and other viscera, warranted the assumption that the growth was primary cancer of the appendix. The observers note the exceeding rarity of the primary tumors of this diverticulum of the intestine. Of seventeen cases of primary tumor collected by Lafforgue in the study of the subject, nine were cancers, one lipoma, and one myoma.

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ANTITOXIN TREATMENT OF PNEUMONIA.¹

BY ANDREW H. SMITH, M.D.,
NEW YORK.

It is extremely probable that the pneumonic process, as we see it from the moment of invasion to the crisis, implies infection by the agency of a continually changing set of microbes. Welch has shown that the virulence of the coccus is inversely as its age, the organisms taken from the centre of a pneumonic focus having very little potency, while on the edge of a patch which is still spreading they are most active. The inference to be drawn from this, and which is also supported by the behavior of artificial cultures, is that the infection of the system is not maintained through the whole period of pyrexia by the same microbes, but by a constant succession of cocci, the older ones becoming inert, and fresh ones carrying on the work of supplying the toxin. This supply fails soon after the local process has ceased to spread, simply because there are no longer any young bacilli to maintain it. But while it would seem as if this might afford a sufficient explanation of the phenomena of defervescence by crisis, yet the observations of the Klemperers and of subsequent investigators make it reasonably certain that there is an antitoxin produced that has its share in the result. We are apt to think of the process of absorption by which resolution is ultimately effected as beginning *after* the crisis, whereas it is in operation from the first moment of the disease, as is shown by the early infection of the general system which it brings about. Up to the point of consolidation the rate of deposition is far greater than that of removal, and

¹ Read before the Association of American Physicians, May 5, 1898.

a rapid accumulation of exudate takes place in the air-cells. This exudate, however, is not permanent in constitution. It immediately begins a process of change, and, as we have seen, the organisms contained in it change their properties also. As time goes on there comes a period when the deposition of fresh infective material is less active than the absorption of that which is older. At this point an antitoxic effect becomes apparent, and in the cases terminating by crisis a rapid fall of temperature takes place. In the cases terminating by lysis, either the deposition of fresh material is protracted by the invasion of new territory or the absorption of the older material is for some reason less active.

As early as 1888 Netter rendered mice and rabbits immune to pneumonia by injecting them with fluid prepared from the dried spleens of infected animals. Subsequently he employed an old pleuritic exudate containing pneumococci, and at last the sputum of a pneumonic patient which had ceased to be virulent after the crisis.¹

Pursuing this line of investigation, Foa found that the injection of an attenuated culture of the diplococcus of pneumonia into an animal gave immunity against the disease for several months. He produced the injection serum by precipitating with ammonium sulphate the culture broth containing the diplococci, and filtering repeatedly. The filtrate was injected into the veins of rabbits daily for three or four days. Again, he made an extract of the muscles and viscera of a rabbit dead from pneumonia, precipitated it in the same way, and got the same immunity. The extract from a healthy rabbit when injected gave no immunity.

He then studied the immune animal, drawing the blood and taking the serum after coagulation to inject another animal, which also became immune. As a control experiment, he injected a rabbit with blood of a man dead of pneumonia; death resulted. He states that several species of virus are formed, one seeming to act on the nervous system, another on the blood and tissues.

The Klemperer brothers verified these results.² Their report is briefly as follows: Two rabbits were injected, each with 20 c.c. of pleuritic exudate taken from a pneumonic patient and which by culture was shown to be free from living bacteria. Fourteen days later both were inoculated with a virulent culture. Both survived, while the control animal died. Later, they immunized animals with pneumonic sputum taken before the crisis and heated so as to destroy the poison. The same result was obtained by heating to 60° C. a glycerin extract of pneumococci. The bacteria were washed from agar culture with sterilized

¹ *Centralblatt für klinische Med.*, 1888, ix. No. 15.

² *Berliner klin. Woch.*, August 24 and 31, 1891.

glycerin, which was exposed to heat for one or two hours and filtered repeatedly. They found that immunity resulted from doses proportioned in quantity to the strength of the preparation. It was employed subcutaneously.

They found further that dogs can be immunized against pneumonia, and can also be cured of the disease. This cure takes place through the serum of immune animals immunized by taking in the products of the activity of the pneumococcus. This immunizing serum does not cure by killing the cocci in the system, for after four days' contact with the serum the bacteria injected into an animal caused death. In fact, the bacteria in contact with this serum increase in number. At the same time the serum, if injected, prevents the formation of the poison in the body of the animal. This may be explained in one of two ways: either the serum hinders their power of forming poison, or the cocci go on forming poison, and the serum counteracts its effects, or through chemical changes renders it inert. At any rate, the cocci become harmless to the animal, their evil influence being destroyed by the reaction of the body cells, especially the white blood-corpuscles. If pneumotoxin and curative serum be mixed and injected into an animal, there is no rise of temperature and no effect from the poison, while toxin alone kills the animal, with symptoms of septicæmia.

They next inquire whether the pneumonia cured in animals by the serum is identical with pneumonia in man. Their autopsies on animals dead of pneumotoxin injections did not show the fibrinous exudation in the lungs characteristic of pneumonia, but diplococci were found in the blood. However, it is not the pneumococci themselves, but the poison that they produce, that gives the septicæmic symptoms. This poison, when formed at the seat of injection, reaches the blood sooner than the cocci themselves. Also, if we filter out the cocci, the poison remaining in solution kills the animal injected as effectually as the original culture.

In contradistinction to animals, man is only slightly susceptible to the pneumococcus. Living cocci can exist on healthy mucous membranes without doing harm, and are found in the sputum of healthy men. If we inject men subcutaneously, what results do we get? The Klemperers experimented by injecting themselves, and found that no reaction resulted from small amounts; from larger ones a local swelling, with rise of temperature and febrile symptoms, resulted, passing away in a few days. Hence, they conclude that men are much less susceptible than dogs to the same relative doses.

They conclude that in man it is not the exudation in the lung that renders the disease so grave, but the general infection from absorption of the bacterial poisons in the exudate into the circulation, acting on the heart and vital centres, and producing febrile symptoms. In ani-

mals injected, the poison enters the blood stream directly and produces fever at once. The poison increases for some days and then the antitoxin is produced, and immunity results. Serum taken from pneumonic patients after the crisis is found to cure pneumonia in dogs. They conclude that from pneumotoxin in man is produced antitoxin at the time of the crisis, and this counteracts the effects of the toxins. Thus the so-called crisis in man is the beginning of the formation of the antitoxin, and though the cocci remain for some time in the blood, they are no longer harmful.¹

They then question whether immunity in man results after the crisis, and conclude from researches and experiments that it does occur, but is only temporary.

With regard to the treatment of pneumonia, they say at present we use supportive measures, awaiting the formation of antitoxin. But the aged and the weak succumb. They suggest that, by using the immunizing serum from animals, we may hasten this process and save lives. They have treated some cases in this way with apparent benefit, as shown by fall of temperature and slowing of pulse and respiration. But a sufficient number have not as yet been treated to arrive at a definite and final conclusion as to the value of the treatment.

An important discussion on this subject took place at the Academy of Medicine in Turin, December 2, 1892.²

Lara, chief physician of the Hospital San Giovanni, reported the results of ten cases of pneumonia under serum-treatment. Five of these cases were double, five single. Eight of the patients were young persons, two advanced in years; six were robust, four of debilitated habit. The serum was in some cases from immunized rabbits, in other cases from dogs, and in still other cases a glycerin extract was employed made from the viscera of refractory animals. In no case was there any local reaction. The glycerin extract produced no observable general symptoms. Serum from dogs caused nervous excitement; that from rabbits produced general agitation and a temporary aggravation of the disease.

In all but three cases there was reduction of temperature, not sudden, but after an interval.

A change in the character of the pulse was observed, without a reduction in the number of beats.

There was no immediate change in the respiration, but, after a time, it became somewhat slower.

The crisis took place in from three to five days. The convalescence was rapid and complete; complications were rare and of little gravity. The reporter considered the results encouraging.

¹ This statement is not in accord with more recent observations which show that cases in which cocci are found in the blood generally prove fatal.

² *Journal de Médecine*, 1893.

Bozzolo reported five cases treated with serum from rabbits, prepared by a special process not described. There was rapid fall of temperature in every instance. Four of the patients recovered, and one died after defervescence. The kidneys were unaffected.

De Renzi reported that during the past year he had treated ten cases of pneumonia with anti-pneumococcic serum, prepared as follows :

The animals are inoculated with a non-lethal quantity of pneumonia virus, the dose of which is gradually increased until a strong immunity is produced. Serum from these animals is injected into the patient. Only severe cases were selected for treatment. In every case a cure resulted. In one case the temperature came down on the third day, although there were signs of diffuse hepatization. Of five other cases admitted during the year, and not treated with serum, one died. Although the author admits that his cases might have recovered without the serum-treatment, he considers his results decidedly encouraging, as pointing to a real and efficient treatment of pneumonia.¹

Wiesbecker² reports five cases of pneumonia treated with injections of serum obtained from patients recovering from the disease. While there was no uniformity in the results, as far as the objective signs were concerned, these becoming more and more severe in some cases after the injection, while in others the severity abated, there was in every instance a most remarkable improvement in the subjective conditions. This improvement was almost instantaneous, in one case being manifest within one and one-half minutes after the injection. But for one instance, in which the patient was a child only three years of age, we should be inclined to refer these marvellous results to suggestion, especially as they did not conform to the physical conditions present at the moment. Difficulty of breathing, pleuritic pain, malaise of every description disappeared as if by magic ; recovery took place in every case, though not always with remarkable promptness. The quantity of serum in each case was 10 c.c.

Similar to this was the experience of Fourriere,³ in a single case treated by injections of goat's blood. The patient, a person past middle age, was recalled to life from an unconscious, fairly moribund condition, and, though death occurred after several days, there was an interval during which danger seemed to be over and recovery assured.

In 1897 Washbourne, of Guy's Hospital, published his researches on anti-pneumococcic serum. His method was essentially that employed in producing diphtheria antitoxin. A pony was the animal selected, and after nine months' treatment, first with living and then with dead cultivations, the serum was found to possess marked protective powers.

¹ British Medical and Surgical Journal, March 28, 1896.

² Zeitschr. f. klin. Med., 1897, xxxii. p. 188.

³ Journal de Médecine, January 1, 1893.

By using a special method of cultivation it was found possible to maintain the virulence of the pneumococcus at a given level for a period of sixty-six days. This process is described in detail in the *Journal of Pathology and Bacteriology* for January, 1898. To maintain the virulence of this culture it must be kept in an incubator at a temperature of 37.5° C. He claims that under these conditions the antipneumotoxin can be accurately standardized.¹

Several cases of pneumonia have been treated by Washbourne and others with this serum. While its influence cannot be distinctly traced, it can fairly be considered to have contributed to the favorable result in some extremely unpromising cases.

We cannot avoid the conclusion, from this résumé of the achievements of serotherapy in its application to pneumonia, that up to the present time they can scarcely be said to amount to more than an encouragement to further effort. No really decisive results have been obtained.

In some cases the effect seems to have been favorable; but, in view of the variable course of pneumonia under all forms of treatment, it is impossible to assign to the injections any positive share in the result. It can be only by the accumulation of a large number of observations that a conclusion as to the value of the treatment can be arrived at, and, unfortunately, the difficulties in the way of extended observations are such as to deter most investigators from pursuing the subject.

The first difficulty is found in the short life of the pneumococcus and its feeble power of resistance. Cocci that are virulent at the beginning of an investigation cease to be so as the investigation proceeds. On the other hand, toxins that are expected to produce only a moderate reaction when injected, sometimes display an unlooked-for virulence. Animals apparently progressing normally toward immunity most unexpectedly succumb to septicæmia from a dose of toxin supposed to be entirely within the limits of safety. Again, animals that were readily immunized at first, lose their immunity in spite of renewed inoculations, and the serum obtained from them ceases to be reliable. This variation in the conditions under which experimentation is conducted is liable to vitiate the most carefully-drawn conclusions. If this be true under the favorable circumstances of the laboratory, what must it be in the exigencies of ordinary practice? If before employing a therapeutic agent we must resort each time to experiment to test the value of the specimen in hand, the usefulness of the agent will be very limited.

It is to be hoped that this difficulty has been overcome by Washbourne's method, already mentioned, and that it will be possible in the future to command a supply of reliable antitoxin for the treatment of

¹ British Medical Journal, 1897.

pneumonia, as we already do for the treatment of diphtheria. Efforts to produce such a supply are now being made by the Health Board of New York. Should they be successful the value of the method will soon be determined.

PRIMARY MALIGNANT DISEASE OF THE SUPRARENAL BODIES.

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A GREAT deal of attention has recently been paid to the nature and origin of suprarenal tumors, and especially of growths derived from outlying bits of the organ, accessory suprarenal bodies, or suprarenal "rests." These latter tumors, which are composed of suprarenal tissue, but are not of the suprarenal body proper, have aroused much interest, because they illustrate so aptly Cohnheim's theory of the origin of tumors from foetal inclusion, and because when the suprarenal rest is embedded in the substance of the kidney they give rise to a proportion, probably by no means large, of renal growths.¹ But, clinically, the latter cases are, of course, indistinguishable from renal tumors.

Tumors arising in the suprarenal bodies themselves are so near the kidney that they often resemble them clinically, and may easily be mistaken for them. In this paper we propose to record a case of primary malignant suprarenal growth presenting some special points of interest, and to offer some remarks on the general symptomatology and pathology of such cases. For this purpose we append brief notes of five other cases from St. George's Hospital (Table I.) which we have examined microscopically, and of twenty other cases, fourteen of which (Table II.) are collected from literature. And here we would express our indebtedness for references to the papers of Drs. Affleck and Leith in the *Edinburgh Hospital Reports* (vol. iv.), and of Dr. Kelynack, in the *Medical Chronicle* for September, 1897. We have, however, only referred to fourteen cases in literature, which are, we believe, undoubted cases of primary malignant disease of the suprarenal bodies. We have accepted only those which appeared to be certainly primary, and in which the malignant character was shown either by secondary growths or the invasion of adjacent parts. We have, therefore, omitted a number

¹ Vide Targett (Trans. Path. Soc. London, 1896, vol. xlvii. p. 126), who believes that the frequency of this class of tumors has been much exaggerated by some writers.

of cases which, though described, and very possibly quite accurately, as sarcoma, do not conform to the conditions we have laid down.

The notes of six other cases (Table III.), not previously published, have been obtained from various sources, and we beg to thank Drs. S. Fenwick, Sansom, Penrose, and Still, W. T. Brooks and Mallam, and Mr. Targett for their kind courtesies.

Of the six cases from St. George's, including the present one, two have been previously published by Dr. J. W. Ogle and by Dr. Lee Dickinson, respectively, in the *Pathological Society of London's Transactions*; but, as we have had the opportunity of examining them histologically, they are included together with our other cases in Table I.

CASE I.—The patient was a man, aged fifty years, admitted to St. George's Hospital July 2, 1897.

The *past* history was uneventful; he had never had syphilis or rheumatic fever, and generally had enjoyed good health.

The *present* illness began two months ago with pain in the lower part of the abdomen extending round to the back at the level of the spine of the scapula; for the first week it was intermittent, but since then had been continuous. It had no relation to food, but was worse at night and on lying down, and was relieved on stooping. There had been no vomiting; the bowels were confined; he had passed slime three or four times, and the motion had been noticed to be tarry. Difficulty and pain on micturition had existed for three weeks, and had been accompanied by frequent nocturnal calls to pass water. There had never been any hæmaturia. Defecation was also painful. Had lost three stone in weight in the last two months.

Present state. A pale man, with an anxious expression, bad appetite, and a pulse of 112, artery thickened. The urine was normal.

The heart was natural and, except for a few crackles on the left axilla, the lungs were normal.

Over the fourth and fifth dorsal vertebræ there were tenderness and considerable stiffness, which, however, soon passed away.

The abdomen moved on respiration, was retracted, with resistance of the muscles, and at first nothing abnormal except slight splenic enlargement was found. Two weeks after admission pulsation and a systolic murmur were noticed to the left of the middle line between the umbilicus and the left hypochondrium, but no tumor could be made out. The murmur could not be heard behind. With rest in bed the patient improved considerably, the physical signs became rather less marked, and on August 19th he went to a convalescent home, the probable diagnosis being abdominal aneurism.

He was readmitted to the hospital on September 7, 1897, in much the same condition as in July, with constipation, pain in the abdomen and back, and difficulty in micturition. He had lost seven pounds in weight while in the convalescent home.

The abdomen was somewhat distended, and seemed to contain some ascitic fluid. It was excessively tender all over, particularly just to the left of the epigastrium; in this situation the note on percussion was dull, and there was obscure pulsation; no tumor could be felt, and

at first no bruit was heard in this situation. The physical signs were in fact less marked than during his previous stay in the hospital.

Ten days after admission a bruit was heard at the junction of the epigastric, umbilical, and left hypochondriac regions; but no tumor or dulness was detected, though obscure pulsation was felt. The ascites had increased, and there was some œdema of the feet. On September 20th he brought up three-quarters of a pint of blood from the stomach and passed blood per rectum; this left the patient somewhat blanched; the area in the abdomen over which pulsation could be felt and the systolic bruit could be heard had considerably increased, and, in addition, the second sound of the heart was heard, but no tumor could be made out.

On September 22d hæmetemesis and melæna came on again, and he died collapsed.

For the last eight days the temperature had been raised to 100° F., with a few intermissions, without any apparent reason. While in the hospital he was first under the care of Dr. Cavafy, and on the second occasion under Dr. Ewart, to whose kindness we are indebted for permission to publish the case. We are also indebted to Dr. W. J. Fenton for the clinical history.

Autopsy. The body was very anæmic and much emaciated. There was no jaundice or pigmentation.

The lungs were emphysematous, but contained no new growth. The pericardium and heart were healthy.

The peritoneal cavity contained a small amount of turbid fluid, without there being signs of acute inflammation. Nodules of soft, reddish growths about the size of cherries were scattered over the parietal peritoneum of the pelvis and posterior abdominal wall. The great omentum, which was almost devoid of fat, also contained secondary growths; the mesenteric glands were enlarged and infiltrated with new growth.

The stomach and intestines contained recent blood-clot. The stomach had a ragged opening on its posterior wall near the cardia, two and one-half inches in diameter, which opened into a cyst, the walls of which were formed of soft, reddish new growth.

The growth had broken down in the centre, and so given rise to the central cavity, which opened freely into the stomach. The growth appeared to have started from the inside, probably from the medulla of the left suprarenal capsule, a small piece of which was found in direct continuity with the growth. The tumor had then grown toward the middle line and had invaded the pancreas and the posterior surface of the stomach. The naked-eye characters of the growth were so like suprarenal tumors, and so unlike any pancreatic new growth, that we have no hesitation in considering that it originated on the left suprarenal capsule.

On the floor of the cavity inside the new growth the splenic artery was found eroded and opening freely into the cavity formed by necrosis.

For the drawing, which shows the relation of the stomach and new growth, we are much indebted to Mr. E. Wilson, B.A. Cantab.

The right suprarenal body was quite healthy.

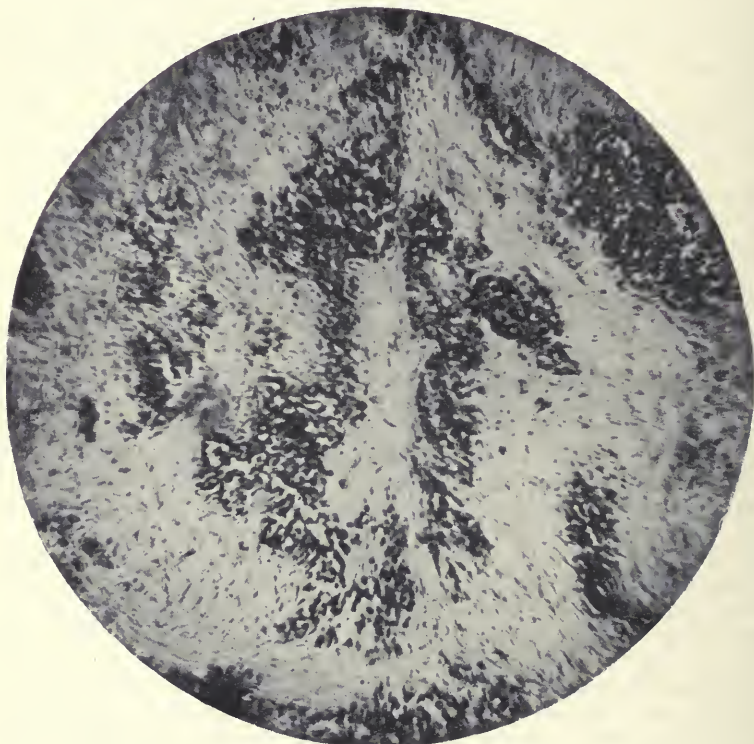
The spleen weighed nine ounces, and was healthy, as were the kidneys. The liver weighed sixty-four ounces and contained numerous nodules of growth; some were as large as a walnut. Those on the surface were softened and umbilicated.

The spine and ribs were normal.

Microscopic examination of the suprarenal tumor in Case I. Numerous parts of the wall of the cystic tumor, as well as pieces of secondary growths, were examined, after being prepared by the paraffin method.

The microscopic appearances are those of an epithelial growth arranged on an alveolar pattern. (Fig. 1.)

FIG. 1.



Spheroidal-celled carcinoma of suprarenal body from Case 1. $\times 100$.

The cells are large and of the epithelial type, and usually spheroidal, but in places seem to have run together to form plasmodion masses or large multinuclear cells. In addition, there are scattered patches, both among the epithelial cells and in the interstitial fibrous tissue, of small round cells. The intervening fibrous tissue is in parts well formed, in other parts it is somewhat loose.

In some parts again there are tracts of epithelial cells that have undergone necrosis and do not stain; here, again, there is some small-cell infiltration, and occasional hemorrhages are seen.

While bearing in mind the appearances that a sarcoma invading fibrous tissue may produce, it appears to us that this tumor belongs to the carcinoma class, as is shown by the epithelial character of the cells and their alveolar arrangement. The small-cell infiltration is probably due to the inflammatory changes which are bound up with the necrotic

destruction of the tumor. The evidence of the necrosis and hemorrhages which, in combination, have transformed a large part of the tumor into a pseudo-cyst has been already referred to.

REMARKS. The special interest attaching to this individual case is that the symptoms and signs pointed to the diagnosis of a diffuse aneurism in connection with the commencement of the abdominal aorta. Some five and a half years ago one of us examined post mortem a man, aged twenty years, with a large diffuse aneurism arising from the upper part of the abdominal aorta and occupying the left pleura, under Dr. W. H. Dickinson's care in St. George's Hospital. The general aspect of the two cases was not unlike, and there was so little pulsation in the latter that, although aneurism was correctly diagnosed, the question of caries of the spine with a large abscess was very seriously considered. We are indebted to Dr. S. Fenwick for the notes of a case of his in the London Hospital (No. 22) in which the pulsation of a vascular suprarenal growth, though not expansile, simulated an abdominal aneurism. In the present case the hæmatemesis and melæna, which eventually proved fatal, suggested that an aneurism had burst into the alimentary canal. The communication of an adrenal growth with the stomach appears to be unique, but reference may appropriately be made to a case of Dr. Hale White's,¹ in which carcinoma of the pancreas, arising in what is a very exceptional position, namely, the body of the gland, and not invading the head, spread to and perforated the stomach, giving rise to fatal hemorrhage.

Hemorrhage from the stomach, however, occurred in the case recorded by Affleck and Leith,² but was due to a gastric ulcer. It is also conceivable that a growth in the right suprarenal capsule might so interfere with the portal vein as to lead to great venous engorgement of the stomach, and so to venous oozing and hæmatemesis; but as far as we know there is no case to support this hypothesis (vide Case 21).

It is noteworthy that in this, as in nearly all the previously recorded cases, there was no resemblance to Addison's disease.

Other points of interest in the case will be referred to in the discussion of the clinical and pathological features of primary malignant tumors of the suprarenal bodies.

GENERAL REMARKS ON PRIMARY MALIGNANT SUPRARENAL GROWTHS. *Frequency.* Affleck and Leith³ collected twenty cases of primary sarcoma, and Kelynack,⁴ in a valuable critical paper on adrenal growths, only admits one case of undoubted carcinoma. Many more cases are recorded as cancer, sarcoma, or carcinoma; but some of these are undoubtedly secondary to disease elsewhere, while

¹ Hale White. *International Clinics*, series 1896-97, vol. iv. p. 85.

² *Edinburgh Hospital Reports*, vol. iv. p. 278.

³ Affleck and Leith. *Loc. cit.*

⁴ Kelynack. *Medical Chronicle*, 1897, new series, No. 6, vol. vii. p. 401.

others are almost certainly examples not of malignant disease, but of adenoma. The relation between adenoma and malignant disease of the suprarenal bodies will be referred to later. In order to be quite certain that we are dealing with cases of undoubted malignant disease, we have only included cases where there were secondary growths or invasion of adjacent parts. It is probable that genuine cases of primary malignant disease have been excluded by drawing this hard-and-fast and, perhaps, artificial line; but this seems the only certain way of avoiding the inclusion of vascular or hemorrhagic adenomata. Pilliet's¹ case, in which there were extensive thrombosis of the inferior vena cava and œdema of the legs, was apparently a true sarcoma; but, as there were no secondary growths, we have not included it among our cases.

In Lazarus's² case of a child, aged three and a half years and weighing thirty-seven pounds, the left suprarenal formed a tumor weighing twelve pounds, and was a sarcoma; but since no mention of a second growth is made, we have felt obliged to omit it. Much the same may be said about other cases.

Cohn³ refers to Mankiewicz's thesis (Strasburg, 1887), in which a round-celled sarcoma in a child, aged two years, is described, but we have not been able to see the original thesis to find out whether there were any secondary growths.

Primary malignant disease of the suprarenal bodies is distinctly rare; we have collected twenty-six cases in all from literature, from the London hospitals and museums, and from various private sources. Mr. C. F. Beadles has kindly informed us that in 4800 autopsies at Colony Hatch there was no undoubted case of the kind.

Sex. The incidence of the disease is evenly distributed between the two sexes. Of our twenty-six cases there were thirteen males and thirteen females.

Of the thirteen males three were carcinomatous and eight sarcomatous, the nature of two cases being undetermined, while there were six cases of carcinoma and seven of sarcoma in women.

Age. In our twenty-six cases the average age was thirty-seven and a half years; in Affleck's and Leith's twenty cases of primary sarcoma of the suprarenal bodies the average age was higher, forty-five years.

The extremes in our cases were nine months and seventy-three years, both in females; four cases, all of them females, were under four years of age. The extremes among the male cases were twenty-five and sixty-two, the average being forty-five and five-tenths years. The

¹ Pilliet. Bull. Anat. Soc. Paris, 1888, p. 716.

² Medical Press and Circular, 1894, vol. i. p. 457; and Berlin. klin. Wochenschrift, May 21, 1894.

³ Cohn, M. Berlin. klin. Wochenschrift, March, 1894.

average age of the thirteen female cases was only thirty-one and two-tenths years, being pulled down by the occurrence of four cases under four years of age.

R. Williams¹ mentions that in thirty-six cases of primary malignant disease of the suprarenal bodies collected from literature a third were in children. Our figures differ somewhat from his, but, as has been pointed out, we have not accepted as sarcoma or carcinoma all the cases that have been thus described.

The average age of the nine cases of carcinoma was forty-four and one-tenth years, being fifty and six tenths years for the three males and forty and eight-tenths for the six females.

The average age of the eighteen cases of sarcoma was thirty-two and three-tenths years, being thirty-nine and nine-tenths years for the eight males and twenty-three and six-tenths for the seven females.

Thus sarcoma, as is generally the rule, occurs at an earlier age than carcinoma, and the female sex is attacked earlier than the male.

Morbid anatomy. To the naked eye primary malignant suprarenal tumors conform pretty uniformly to one type, being vascular, soft, rapidly-growing, and having a marked tendency to undergo fatty degeneration, necrosis, and softening in their interior, with the formation of a central cavity which contains a mass of blood-stained and degenerated growth. Probably for this reason they have been sometimes called cystic sarcomata.

A similar softening may occur in undoubted adenomata arising from the cortex, and Letulle² has described, under the name of diffuse fatty adenomata arising from the cortex, tumors which have a very close resemblance to malignant tumors, but differ from them in not infiltrating the surrounding tissues or producing secondary growths.

Since it is almost impossible to differentiate between the histological appearances of an adenoma disorganized by hemorrhage and those of a primary adrenal growth, which, as shown by the presence of secondary growths, is certainly malignant, it is safest to rely on the infiltration of adjacent organs, such as the kidney or liver, or on the presence of secondary growths as evidence of malignancy rather than on the microscopic structure; and, as stated above, we have acted on this.

Practically there does not seem to be any very marked difference between the incidence of disease on the two sides of the body. In the twenty-five cases in which the seat of the primary growth affected is mentioned, the right side was affected in thirteen, the left in nine, while the growth is said to have affected both primarily in three, two of these being carcinoma, and the other sarcoma.

Method and direction of growth. Usually the tumor grows forward,

¹ Williams, R. *Lancet*, 1897, vol. i. p. 1261.

² Letulle. *Archives de Science Méd.*, June 1, 1896, p. 80.

but, from its pseudo-cystic character, is less readily felt than a solid renal tumor. It may spread laterally under the peritoneum, and thus cross the aorta and involve the corresponding organ on the opposite side.

It is a possible explanation of cases where the growth appears to arise simultaneously in both suprarenal bodies, that the growth arises in one and then spreads by continuity to the other, the connection being insignificant as compared with the growths in the suprarenal bodies.

Probably some of the retroperitoneal sarcomata in the upper part of the abdomen may be derived from the suprarenal bodies;¹ in two large-celled hemorrhagic growths of this nature examined by us their origin either in the suprarenal or accessory suprarenal bodies was suggested, but could not be proved.

On the right side a malignant tumor may invade the right lobe of the liver by spreading directly to the free surface uncovered by peritoneum with which it is in contact. On the left side it does not appear to spread to the spleen, but as seen in our case it may attack the pancreas or stomach. If it infiltrates the kidney it may spread into the renal vein (Case 2), and even project into the inferior vena cava. It is, perhaps, a question whether the extension of a growth, not otherwise manifestly malignant, into the suprarenal vein should be regarded as undeniable evidence of malignancy, for it is known that somewhat analogous growths, the multiple adenomata of the liver, may discharge their contents into the portal vein,² and so give rise to the appearance of a malignant growth. It has seemed to us that the proof of the carcinomatous nature of some cases of so-called primary carcinoma of the liver, with cirrhosis, chiefly rests on the condition of the veins which contain extruded, softened adenomatous material or blood-clot, and that this criterion is open to justifiable criticism. There is, as Kelynack has pointed out, a striking resemblance between adrenal and hepatic adenomata, and we consider that the occurrence of suprarenal tumor-cells in the capsular vein would not of itself justify a positive diagnosis of malignant growth.

Secondary growths. The liver was the seat of secondary growths in fourteen out of our twenty-six cases, and was, in addition, invaded by continuity in three. The lungs were next in order, being occupied by secondary growths in six, the bronchial glands were also invaded in one of these six cases, while in the other case, in which the bronchial glands contained secondary growths (Case 24), the lungs were free.

The pleura was affected in three cases.

Secondary growths occurred in the kidneys only three times; but, in addition, the kidney was invaded by continuity in four other cases.

¹ Vander Veer. THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, January, 1892, vol. ciii. p. 22.

² Compare Delepine. Trans. Path. Soc. London, vol. xli. p. 363.

The aortic lymphatic glands were affected in six cases and the peritoneum on three occasions.

The stomach and pancreas were each affected twice, both of them being certainly invaded by continuity in Case 1, and it would have seemed probable that, from its close anatomical relations, the pancreas must frequently be infiltrated when the left suprarenal is the seat of new growth. This, however, does not appear to be the case in the recorded examples. The heart was affected in one case, as were the cerebrum, cerebellum, bones, and skin. The other adrenal was infiltrated by secondary growth in two cases.

Condition of the opposite suprarenal body. As already mentioned, the other suprarenal may become invaded by growth, either by continuity or by a true secondary neoplasm. It is, perhaps, difficult to prove that both suprarenals have been simultaneously affected by primary new growth, but this is the described condition in three instances (Cases 10, 16, 19). In two of our collected cases (21, 22) it is definitely stated that the other suprarenal body, though not invaded by growth, was enlarged. This suggests that compensatory hypertrophy may possibly take place in man, as it does in animals (Stilling). Whether this occurs in adults has not been established, but one of us has observed as many as five accessory suprarenal bodies on the right side in a boy, aged seventeen years, who died of chronic phthisis, without any signs of Addison's disease;¹ this suprarenal body contained caseous tubercle.

Association with disease or malformation of the corresponding kidney may only be a coincidence, but it must be borne in mind that congenital abnormalities or acquired changes in the adjacent kidney might quite conceivably be accompanied by or set up conditions in the suprarenal capsule which make for a typical or exaggerated growth. In this connection we may note, on two occasions we have seen adenomata of considerable size associated with chronic nephritis. The instances in which the association of disease or malformation of the kidney with adrenal neoplasm have been noted are, however, very few; thus in one case (No. 15) there was a double ureter on the same side; in Dr. Lee Dickinson's case (No. 4) a hydronephrosis of the kidney on the same side preceded the development of the adrenal growth for many years. In a case of tumor of the medulla of an accessory adrenal, recorded by Eurich,² there was congenital atrophy of the corresponding kidney.

Dr. F. C. Turner³ recorded a case of round-celled sarcoma of both the suprarenal bodies in a case where there was a horseshoe kidney. There was a similar growth in the posterior mediastinum, and, since it is doubtful which of the two was the primary, the case has not been

¹ British Medical Journal, 1895, vol. i. p. 620.

² Eurich. Journal of Pathology, vol. iii. p. 505.

³ Turner, F. C. Path. Soc. Trans., vol. xxxvi. p. 465.

included in our table. In Ritchie and Bruce's case nephroptosis followed the development of carcinoma of the suprarenal bodies, probably as the result of loss of fat.

It may be noted that in the first of two cases of "renal tumors derived from suprarenal rests," described by McWeeney,¹ the left kidney had for some time been floating, and six months before the tumor was removed the kidney, which then appeared healthy, had been stitched into its proper position (nephropexy) by Mr. H. A. Reeves at the Soho Hospital for Women. For these details we are indebted to the courtesy of Dr. McWeeney and Mr. Coppinger.

In our cases there is nothing to support the hypothesis that a floating kidney has any possible connection with the development of a primary neoplasm of the suprarenal body. Floating kidney is commoner in women and on the right side; in the thirteen female cases the growth was six times on the left side, five times on the right, and twice on both sides, and in none of them did nephroptosis precede the development of the tumor.

HISTOLOGICAL CHARACTER OF MALIGNANT SUPRARENAL TUMORS. Almost all the published cases have been described as sarcomata, Ogle's, Ritchie's, and Bruce's, and Weinburg's and Turquet's cases of carcinoma being the exceptions. Various forms of sarcoma have been met with, large or small round-celled, mixed or irregular, spindle-celled sarcoma with (Case 7) or without giant cells, etc.

Of our twenty-six collected cases the nature of the growth is definitely described in twenty-four; of these, nine are carcinoma and fifteen sarcoma.

The sarcomata were as follows :

Mixed or irregular celled	3
Round	2
Small round	2
Large round	1
Spindle	1
Small spindle	1
Myosarcoma	1
Sarcoma (no further description)	4

Out of our own cases (1 to 6) from St. George's Hospital there are no less than four, however, which we incline to call carcinoma, the other two being sarcoma.

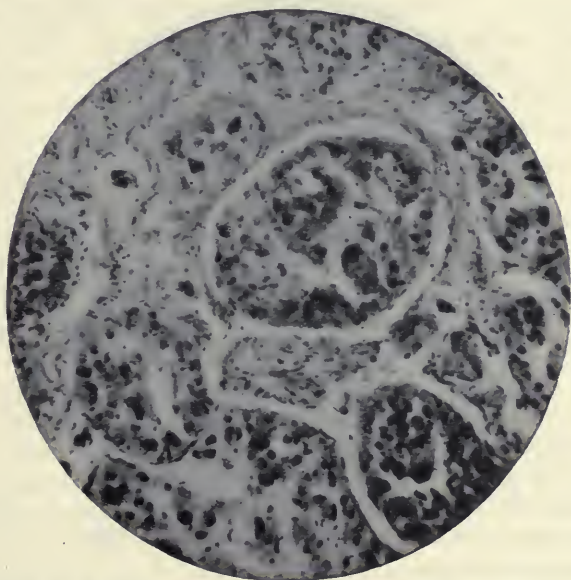
The rarity of carcinoma in the recorded cases naturally makes us feel that great caution is required before definitely deciding that as many as four out of our cases of primary malignant disease of the suprarenal bodies are carcinoma. The arrangement of these suprarenal tumors

¹ McWeeney. *British Medical Journal*, 1896, vol. i. p. 323; and *Transactions of the Royal Academy of Medicine in Ireland*, vol. xiv.

which we consider carcinomatous is far from uniform ; they, indeed, seem to vary in different parts in a manner which is almost characteristic. In some areas there may be a regular alveolar arrangement with well-formed fibrous tissue enclosing cells which are undoubtedly as epithelial as those in the normal adrenal body, while in other parts of the same tumor the appearances differ widely and, if seen alone, would certainly suggest sarcoma rather than carcinoma.

In Case 3 the structure was undoubtedly that of a spheroidal-celled carcinoma, and was specially well shown in the secondary growths in the liver. Much the same structure was found in Case 1, already described.

FIG. 2.

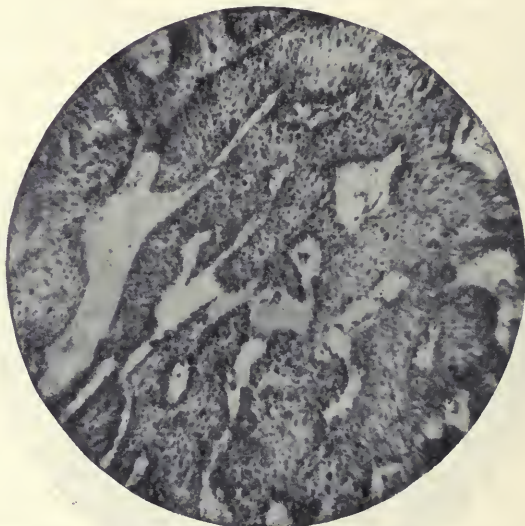


Microphotograph of malignant adenoma of suprarenal in a child three years old—Case 6.
× 100.

In Case 6 (Fig. 2) the alveolar arrangement is well marked, columns of well-marked epithelial cells being separated from each other by capillaries, some of the epithelial cells are large, and may be called giant cells, while in the centre of the epithelial column the cells do not stain, and necrosis is taking place. This appearance might well be called an adenoma, for Manasse has described giant cells in adenomata, and degeneration changes are quite common in suprarenal adenomata. In this case the growth, however, cannot be merely an adenoma, for there were numerous growths in the liver, which weighed ten and one-half pounds, but must be regarded as a "malignant adenoma," or carcinoma. In other areas of the same tumor the appearances are quite different :

the alveolar arrangement is lost, either entirely or almost so, and there are hemorrhages and areas of necrosis. Here it appears probable that very rapid growth has taken place and that there is little interstitial tissue formed, while the general arrangement has been greatly disturbed by the occurrence of hemorrhage. On the whole, these three cases appear to have the structure of carcinoma rather than of sarcoma. We have already re-examined Dr. J. W. Ogle's specimen (St. George's Hospital Museum, Series x., No. 33 c) (No. 6, Table I.), and find that it has practically the same structure as Case 5, and should therefore be called a "malignant adenoma," or carcinoma.

FIG. 3.

Microphotograph of malignant adenoma of suprarenal—Case 5. $\times 100$.

It may be noted in passing that the occurrence of a carcinomatous tumor in a child aged three years is most exceptional, if not quite unique, and is further evidence of the peculiar character of suprarenal neoplasms. So that four out of the six tumors examined by us belong to the group of malignant epithelial tumors, two of them are spheroidal-celled carcinoma, while the other two (Figs. 2 and 3) we propose to call malignant adenomata. The latter, it may be added, closely resemble the figures given by McWeeney,¹ in his description of "kidney tumors derived from suprarenal rests."

The difficulties surrounding the nomenclature of tumors arising in the kidney from suprarenal "rests" have been fully recognized and discussed by McWeeney. He describes two cases which he inclines

¹ Loc. cit.

to call carcinomata; but since they are developmentally mesoblastic and morphologically epithelial, he cautiously is content to term them "kidney tumors derived from suprarenal rests." The same difficulty, of course, applies to the primary malignant tumors of the suprarenal body which histologically resemble carcinoma rather than sarcoma. Nothing is gained by calling them endotheliomata, and it appears justifiable to call them carcinomata, according to their structure, and for the time being to neglect the developmental origin of the suprarenal body.

These carcinomatous tumors of the suprarenal bodies seem to form a definite group of carcinoma, from their anomalous and irregular structure.

By reference to our table it will be seen that out of twenty-six cases nine may be called either "malignant adenoma," or carcinoma. At any rate, they belong to the class of epithelial malignant tumors rather than to the sarcomata. Of the rest it is possible that some of those described as round-celled sarcoma might, if examined in other parts, have shown a structure analogous to that of the malignant adenomata or carcinoma. Mr. Morris' description of one of his cases (No. 18) as resembling microscopically the medulla of the suprarenal, is quite compatible with the view that it was a "malignant adenoma;" but we have not included it among either the nine cases of carcinoma or the fifteen cases of sarcoma. It is certain that all the tumors of malignant nature arising primarily in the suprarenal bodies are not of the same nature, since no less than fifteen of our cases belong to the sarcomata, including examples of most of the different varieties. The two cases of sarcoma in the six cases examined by ourselves (Table I.) were both mixed-celled sarcomata. Some of the carcinomata would appear to arise in the medulla, but there are not sufficient data for determining the usual origin of malignant tumors on the suprarenal bodies, whether from the cortex or medulla, or both.

Leith¹ refers to the question whether the sarcomata arise from the suprarenal itself, from its connective tissue, or from that around it, and considers it a barren problem. Our own impression is that malignant tumors of the suprarenal bodies are peculiar and form a special class; they may approach structurally either the carcinomata or the sarcomata and sometimes one and the same tumor may, in different parts, resemble both. We have for convenience divided them into the two categories; but it is, perhaps, questionable whether this classification is always entirely satisfactory or always reliable.

Since the suprarenal bodies may be regarded as mesoblastic from a developmental point of view, and as epithelial from a morphological, it is perhaps natural that it is not always easy to assign the tumors

¹ Edinburgh Hospital Reports, vol. iv. p. 289.

that arise in them to either the mesoblastic (sarcomatous) or epithelial (carcinomata) group of malignant tumors.

It is conceivable, then, that many, though not necessarily all, of the sarcomata arising in the suprarenal bodies are, like carcinomata, derived from proliferation of the secretory cells of the organ.

In passing, it is interesting to note that the difficulties that surround the histology of the malignant tumors of the suprarenal bodies are also seen among other members of the ductless glands, such as the thymus, pituitary, and spleen.

REVIEW OF THE CLINICAL SYMPTOMS. The question whether malignant disease of the suprarenal bodies ever gives rise to the symptoms of Addison's disease has exercised the minds of many observers, and has been discussed by one of us in the Gulstonian Lectures on the suprarenal bodies for 1895. The consensus of experience and opinion is decidedly against the view that secondary malignant growths in these bodies induce symptoms of Addison's disease, and probably this may be explained by supposing that the primary malignant disease kills the patient before there is time for the characteristic symptoms of Addison's disease to appear. Much the same appears to be the case with regard to primary growths in the suprarenal bodies. It does not appear that the complete clinical picture of Addison's disease has been presented by any one case of primary malignant disease of the suprarenal bodies, even when both the organs have been invaded; but some of the symptoms of Addison's disease may occur in primary adrenal new growths. Pigmentation has been observed very rarely; in Lee Dickinson's¹ case, however, it is especially noted that during the last six or seven months of life dirty-brown pigmentation of face, neck, and axilla, with a few patches on the rest of the body, developed; while in both Dr. J. W. Ogle² and Dr. T. Colcott Fox's³ cases in children the skin was gypsy-colored, though not bronzed. Vomiting, probably due to irritation of the abdominal sympathetic, was a marked symptom in Dr. Ogle's and in some other cases.

Asthenia was very notable in Drs. Affleck and Leith's case, and is mentioned in Dr. Dickinson's and Dr. Sansom's cases, but is, perhaps, generally not more marked than in patients dying of malignant disease elsewhere, and this is especially noted as being the case in Drs. Ritchie and Bruce's examples of carcinoma involving both suprarenal bodies.

Pain in the back, often seen in Addison's disease, may also occur in malignant disease, and suggest aneurism or deep seated new growth (Case 7).

Abdominal symptoms and diagnosis. In the first place, as in Case 1,

¹ Dickinson, Lee. Trans. Path. Soc. London, vol. xlv. p. 129.

² Ogle, J. Ibid., vol. xvi. p. 250.

³ Fox, T. C. Ibid., vol. xxvi. p. 460.

the tumor, though of considerable size, may, from its cystic and soft character, entirely escape detection during life, and may from the constitutional symptoms merely suggest deep seated malignant disease, latent carcinoma of the stomach, or aneurism.

Again, though the primary growth may remain comparatively latent, the secondary growths may give rise to such enlargement of the liver that clinically the case is one of malignant disease of that organ, either primary or secondary, without any evidence to show the situation of the original growth.

When the tumor is palpable it may be mistaken for a number of other conditions: when on the right side for tumors or hydatid cysts of the liver (Case 2), but here the hydatid thrill is absent and puncture at best only brings away a little blood. In such cases examination of the aspirated material might reveal the existence of new growth, but care would be necessary, at any rate, when examining the material fresh, to distinguish its constituent cells from the altered liver-cells obtained from the cylinders of softened hepatic substance in the neighborhood of an abscess.

The danger of tapping doubtful abdominal cysts or tumors by inserting a trocar through the abdominal wall is manifest, not only from the possibility of wounding parts of the intestinal tract, but from the risk attaching to leakage of the contents of the cyst into the peritoneal cavity, or from hemorrhage. An exploratory incision is preferable, inasmuch as it is more likely to clear up the diagnosis and is safer for the patient.

Peritoneal effusion is to be expected in cases of intra-abdominal growth from various causes, indirectly from chronic peritonitis set up by the growth, or directly from pressure or obstruction of the portal system.

In two cases leakage from or rupture of the hemorrhagic growth gave rise to the presence of blood in the effusion (Cases 2, 21).

In one case (No. 22) the portal vein was thrombosed, and at the autopsy there was a little blood-stained fluid in the peritoneal cavity. In one case (No. 1) there was some turbid ascitic fluid, which may be explained as due to second growths in the mesentery giving rise to peritoneal inflammation. In Case 4 there was œdema of the abdominal wall, but no ascites.

The resemblance that malignant suprarenal tumors may show clinically to abdominal aneurisms, both in the existence of pain in the back and pulsation (Cases 1, 21), has been already referred to.

Suprarenal tumors may possibly, when large and projecting forward, imitate an enlarged gall-bladder,¹ but they are usually covered by in-

¹ Robson, Mayo. Allbutt's System of Medicine, vol. iv. p. 229.

testines, and are not nearly so tense or firm. Suprarenal tumors hardly ever seem to be associated with jaundice. A large tumor or a secondary growth in the portal fissure might easily produce this, so that its absence in previously recorded cases seems to be but an accident. Vander Veer¹ describes a large retroperitoneal tumor weighing over six pounds, which, arising from the region of the left suprarenal body, so interfered with the bile-duct as to produce jaundice. The tumor was shown microscopically to be a myxosarcoma, and contained mucoid fluid, thus differing from all the cases of primary sarcoma of the suprarenals that we have collected. This case has not, however, been included in our tables, as there is no mention of secondary growths.

A suprarenal tumor is most likely to be regarded clinically as a renal instead of a perirenal tumor, and from their close anatomical relations this is almost unavoidable. From its position in the abdomen, viz., nearer the diaphragm than the kidney, the suprarenal if greatly enlarged might naturally be expected to displace the colon downward rather than forward. Dr. W. H. Dickinson² noted this in Dr. Ogle's case, and it has been therefore looked for in several cases. Sometimes this holds good, but not invariably, and it is therefore not likely to be of much diagnostic value. It is quite possible to lay too much stress on the relation of the colon to renal tumors, and it is interesting to recall Dr. Gee's³ aphorism on this point: "A renal tumor on the left side very often pushes the colon in front of it; but this condition is never found on the right side;" while H. Morris⁴ says that "as an exception a right renal tumor may push the ascending colon down instead of bearing the gut forward in front of itself."

Suprarenal tumors are, as has been seen, particularly liable to become broken down in the centre and to resemble cysts, if indeed they are definitely felt, while renal tumors are (apart from hydronephrosis and cystic disease) solid and readily palpable.

Renal tumors are of course much commoner. With regard to the occurrence of rapidly-growing tumors in children, the probabilities are in favor of renal as against suprarenal tumors, both from the greater frequency of kidney tumors and also from the fact that when suprarenal tumors occur there is no special predilection for early youth, as shown by our twenty-six cases, of which four were under four years of age. Our figures differ somewhat from Mr. R. Williams' thirty-six cases of primary malignant growths of the suprarenal bodies, in which one-third

¹ Vander Veer. THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, January, 1892, vol. ciii. p. 22.

² Dickinson, W. H. Renal and Urinary Affections, vol. iii. p. 722.

³ Clinical Aphorisms from Dr. Gee's Works. St. Bartholomew's Hospital Reports, 1895, vol. xxii. p. 43.

⁴ Morris. Allbutt's System of Medicine, vol. iv. p. 458.

were in children. Rapidly growing sarcomata of the kidneys in children, on the other hand, form a well-recognized class of tumors.

We have recently, through the kindness of Mr. D'Arcy Power, had the opportunity of examining two large sarcomata in young children under his care in the Victoria Hospital for Children. In both cases dissection showed their renal origin, and their microscopic structure was a very small-celled sarcoma, which differs markedly from what is usually seen in suprarenal growths, though occasionally (Cases 8, 10) small, round-celled sarcoma has been described in primary adrenal neoplasms. Hæmaturia would, if present, indicate renal growth, but inasmuch as many cases run their course without it, the absence of hæmaturia has little value as a sign of suprarenal growth as against malignant tumor of the kidney.

It does not appear that there is any criterion by which a suprarenal growth can with certainty be distinguished clinically from a renal neoplasm. The diagnosis is extremely difficult, and must be attempted by attention to the various points of difference referred to above, and by a process of exclusion.

Retro-peritoneal lipomata. This condition, though equally rare, might imitate a large suprarenal growth. Adami¹ has collected forty-two examples, of which one-third were perirenal in origin. The growth is slow, but reaches a large size, most of the recorded cases weighing over twenty pounds. The tumor usually begins on one or the other side of the abdomen, and is accompanied by little general disturbance of health, except emaciation and eventually dyspnoea; œdema of the legs may result from pressure on the inferior vena cava. The disease is much slower in progress than adrenal growths, and is often mistaken for ascites, but repeated tapplings fail to withdraw any fluid, while in fluctuating adrenal growths (vide Case 2) blood is withdrawn.

Pancreatic cysts might be confused with malignant tumors of the left suprarenal body; both of them may, though neither constantly do, lie behind the stomach.

Pancreatic cysts are, however, more tense, harder, and more definitely felt than suprarenal growths.

Hemorrhagic peri-pancreatic cysts and hemorrhagic abdominal cysts may also resemble the rarer condition of suprarenal growth. The position of pancreatic and peritoneal sanguineous cysts is subject to considerable variation, as has been well shown in Mr. Doran's² diagrams, and in some positions are hardly likely to imitate suprarenal growths closely. A history of injury, while suggesting a hemorrhagic cyst, does not prove it, since malignant growths may develop after a blow, while

¹ Adami. Montreal Medical Journal, January and February, 1897.

² Doran. British Medical Journal, 1897, vol. ii. p. 1779.

the history of traumatism is not always forthcoming on the former condition. The nature of the fluid obtained by paracentesis would no doubt assist in arriving at a diagnosis; the presence of ferments or altered blood being in favor of pancreatic and sanguineous peritoneal cysts, and the presence of recent blood or fragments of growth in favor of a suprarenal neoplasm.

The free mobility of mesenteric cysts should prevent any danger of their being confused with suprarenal growths.

Pulmonary symptoms. Dyspnœa may be due to the growth pressing the diaphragm up, as in Case 2, where the tumor was of very large dimensions, and so resemble retroperitoneal lipoma, uterine fibromyomata, and other large tumors such as ovarian cysts or ascitic effusions.

In one of our own cases, and in Dr. S. West's, the patients died with pneumonia, and, since there were secondary growths present in the lungs, it appears not improbable that they played a definite part in the development of the pneumonia. It may, of course, have been merely accidental, as in a case of a girl, aged twelve years, with a tumor described¹ as malignant in one suprarenal, where death was also due to pneumonia; since, however, there were no secondary growths, we have not included this case among the recorded examples of undoubted primary malignant growths.

Œdema of the legs. Affleck and Leith comment on the fact that, although the inferior vena cava was blocked in four or five of their twenty cases of sarcoma, œdema of the feet did not occur. It so happens that in five out of the six cases observed in St. George's Hospital, œdema of the legs was present, and in Dr. Sansom's case from the London Hospital œdema was also present, although the subcutaneous veins over the abdomen were dilated. There was, it is true, mitral stenosis, but œdema does not occur until late in the disease, and examination of the notes does not show that the patient suffered from cardiac symptoms.

Other symptoms. In two cases (19, 25) the symptoms were chiefly those of cerebral tumor which was a secondary growth.

In Case 23 the pressure of the tumor on the nerves of the lumbar plexus gave rise to pain down the left leg; in this case there was an irregular temperature, which, as Butlin and Colby² have shown for sarcoma, is by no means unusual in patients with rapidly growing malignant tumors. The temperature was also raised in Case 4.

Emaciation is often a marked feature, but in Dr. Ogle's case (No. 6) the child, aged three years, was remarkably developed and weighed

¹ Greenhow. Pathological Transactions, vol. xviii. p. 260

² Butlin and Colby. St. Bartholomew's Hospital Reports, 1895, vol. xxxi.

forty-four pounds, which is much in excess of the normal weight at that age, which, according to Galton's *Life History Album*, is thirty-three and one-half pounds in clothes.

Excessive development of hair has been occasionally noted (Cases 6, 26).

The prognosis is, of course, hopeless unless the growth is removed by surgical means. The anatomical characters of primary suprarenal neoplasms would undoubtedly appear to render operative interference more difficult than in the case of renal tumors. Mr. H. Morris¹ has successfully removed a suprarenal growth, but secondary tumors existed in the liver at the time of the operation.

The following conclusions appear to be justified from the foregoing study of the general character of primary malignant growths of the suprarenal bodies.

1. They are rare, but their anatomical characters are fairly constant: hemorrhagic, with a tendency to break down in the centre and form a pseudo-cyst. There is no marked difference in the incidence of the disease on the two sides of the body.

2. Sarcoma is the more frequent form, occurring in fifteen out of twenty-four cases; carcinoma also occurs, being met with in nine cases. There is considerable variation in the structure and nature both of the sarcomata and of the carcinomata met with.

3. The sexes are affected equally, but the average age of female cases (thirty-one and a half years) is much lower than that of males (forty-three and five-tenths years).

4. The average age is thirty-seven and five-tenths years, and is lower in cases of sarcoma than in carcinoma.

5. There is no special tendency to the incidence of these tumors in early life. The four cases which occurred under four years of age were all female.

6. Secondary growths occur most frequently in the liver.

7. The typical clinical picture of Addison's disease is not presented, but in some rare instances it is partially, though imperfectly, suggested.

8. There is a great variety in the clinical aspect of the cases, but the condition which it most often resembles is that of renal tumor. There is no certain way of constantly distinguishing suprarenal from renal tumors, though there are several points which may help in the differential diagnosis.

¹ British Medical Journal, 1893, vol. 1. p. 2.

TABLE I.—CASES FROM ST. GEORGE'S HOSPITAL (6).

No.	Sex and age.	Which supra-renal affected	Nature of growth.	Secondary growths.	Clinical characters.	Pigmentation.	Remarks.
1	M. 50	Left.	Spheroidal celled carcinoma, with some multinuclear cells. Mixed-cell sarcoma.	Liver, peritoneum.	Abdominal aneurism.	None.	Ascites; œdema of the feet. For details see text.
2	M. 25	Right.		In aortic lymphatic glands; growth projects into right renal vein, invades liver and kidney	Those of hydatid cyst of liver; no thrill; previous to admission to St. George's Hosp. was in St. Thomas's, under Dr. Britton, where hydatid was diagnosed. (See St. Thomas's Hosp. Reps., vol. xxi. p. 328.) Puncture only brought out blood; dyspnoea from upward displacement of diaphragm.	None.	Displaced the transverse colon downward, and duodenum to left of the spine, growth crossed the spine and projected to the left of the cardiac end of the stomach; two pints of blood-stained ascitic fluid; œdema of the feet; no peritonitis.
3	M. 40	Right.	Spheroidal celled carcinoma.	Right lung, left lung; liver, especially in lobulus Spigelii; aortic glands.	Only in hospital two days with right-sided pneumonia due to growths in lung.	None.	No ascites; œdema of legs.
4	M. 57	Right.	Mixed-cell sarcoma.	Pleura and lungs; liver extending into inferior vena cava.	Hæmaturia and renal tumor for 8 years. Latterly like Addison's disease. Raised temperature.	Pigmentation, axillæ, nipples, body.	Edema of legs and of abdominal walls, but no ascites; carried asc. colon in front of it. Kidney shows old standing hydronephrosis. Recorded by Dr. Lee Dickinson in Trans. of Path. Soc., vol. xlv. p. 128.
5	F. 52	Right.	'Malignant adenoma.'	Liver 10½ pounds; numerous growths.	At first thought to be leukæmia. Very ill and anæmic with enlarged liver and spleen; ascites; hæmic murmurs, leucocytosis.	None.	Kidney invaded; right pleural effusion; ascites; œdema of legs.
6	F. 3	Left.	'Malignant adenoma.'	Liver.	Constant vomiting. Child was stout, weighing 44 lbs., normal weight for child of that age being 33½ lbs. in clothes.— <i>Vide</i> Galton's Life History Album, p. 12.	Gypsy color of skin; much public hair; a decided moustache.	Colon depressed downward by growth, not carried in front of it. (<i>Vide</i> Dickinson on Renal and Urinary Affections, vol. iii. p. 722.) This case is fully described by J. W. Ogle, Path. Soc. Trans. Lond., vol. xvi. p. 250. The specimen is in St. George's Hospital Museum (series x. 33c.); has been re-examined.

TABLE II.—CASES COLLECTED FROM LITERATURE (14).

No.	Authority.	Publication	Sex and age.	Which supra-renal affected	Nature.	Secondary growths.	Pigmentation.	Remarks.
7	Affleck and Leith.	Edinburgh Hosp.Reps., vol. iv. p. 278.	M. 46	Right.	Hemorrhagic, irregular-celled sarcoma with large multi-nuclear cells.	Liver, stomach, pleura, sternum, ribs, lymphatic glands.	No.	Thrombosis of inferior vena cava; no œdema of the feet; no vomiting; emaciation.
8	Muir.	Quoted by Leith.	M. 31	Right.	Small round hemorrhagic cystic sarcoma.	Invading the liver and kidneys.	No.	
9	Muir.	.....	F. 50	Left.	Cystic sarcoma.	Large retro-peritoneal tumor weighing 26½ lbs.	No.	
10	Rosenstein	Virchow's Archiv, Bd. lxxxiv. S. 322.	M. 40	Right and left.	Small-celled sarcoma.	Lt. kidney, pancreas, heart.	No.	
11	T. C. Fox.	Trans.Path. Soc. Lond., vol. xxxvi. p. 460.	F. 2	Left.	Large-celled sarcoma.	Liver.	Gypsy-colored skin, not bronzed.	Vomiting; ravenous appetite; thrombosis of inferior vena cava; no œdema of feet; colon displaced forward.
12	F. Fränkel.	Virchow's Archiv, Bd. clii. S. 244.	F. 18	Left.	Spindle-celled sarcoma.	Secondary in right adrenal.	No.	
13	C. Berdach	Wien. Med. Woch., vol. xxxix. p. 357.	M. 55	Left.	Small spindle-celled sarcoma.	Liver.	No.	
14	M. Cohn.	Berlin klin. Woch., March 12, 1894.	F. 9 m'n	Right.	Round-celled sarcoma.	Liver, thorax, kidney.	No.	
15	S. West.	Trans. Path. Soc., vol. xxx. p. 419.	M. 57	Right.	Sarcoma.	Bronchial gland, lung.	No.	Double ureter to corresponding kidney; inferior vena cava stretched over growth; death from pneumonia, possibly due to growth.
16	Ritchie and Bruce	Edinburgh Med. Jour., vol. xxxiii. p. 12.	F. 73	Right and left.	Carcinoma.	Lungs.	No.	Vomiting.
17	H. Morris.	Brit. Med. Jour., 1893, vol. 1.	M. 51	.....	Not described.	Nodule behind peritoneum	No mention.	Kidney expanded by suprarenal growth; not invaded.
18	.....	.....	M. 43	Right.	Resembles medulla of the suprarenal.	Skin, liver (seen here during operation), temporal region.	No jaundice.	Upper part of kidney eroded; tumor successfully removed during life; recurrence took place subsequently.
19	Weinberg and Turquet.	Bull. Anat. Soc. Paris, 1897, p. 751.	F. 36	Right and left.	Carcinoma.	Vermiform process of cerebellum. Both lungs.	.....	Dilated stomach, diarrhœa; lumbar pain; vomiting, severe headache due to cerebellar growth.
20	Eberth.	Virchow's Archiv, Bd. lv.	F. 1½/12	Right.	Myosarcoma.	Lt. kidney; peritoneum over diaphragm.		

TABLE III.—CASES NOT PREVIOUSLY PUBLISHED (6).

No.	Source.	Publication	Sex and age.	Which supra-renal affected	Nature.	Secondary growths.	Pigmentation.	Remarks.
21	Dr. Sansom.	London Hospital Museum, 1787.	F. 38	Right.	Round-celled sarcoma, hemorrhagic; rupt're into abdomen, mesenteric gland.	Liver, inferior vena cava blocked.	No; no jaundice.	Inferior vena cava invad'd and blocked by growth. Ascites, hemorrhagic growth ruptured into peritoneum, so free blood clot as well. Dilated veins over abdomen. (Edema of the legs (mitral stenosis). Left suprarenal enlarged, but free from growth.
22	Dr. S. Fenwick.	.....	M. 62	Right.	Carcinoma contained 6 ozs. of blood clot.	Liver, stomach, pancreas invaded by continuity, mesentery.	No; no jaundice.	Clinically it rather simulated aneurism. It pulsated, but pulsation was not expansile. Left suprarenal enlarged, but free from growth. Vena porta and inferior cava thrombosed. A little blood-stained fluid in peritoneal cavity.
23	Dr. W. T. Brooks.	Radcliffe Infirmary, Oxford.	F. 49	Left.	Carcinoma; as in so many cases the appearance was anomalous.	Liver, lungs, left kidney by continuity, right adrenal.	No.	Irregular temperature; emaciation. No vomiting; pain down left leg from involvement of lumbar nerves.
24	.....	Middlesex Hospital Museum.	F. 55	Left.	Large-celled sarcoma, alveolar in parts.	Bronchial glands.		
25	.....	Post-mort. Book and Register, 1888, Hosp. for Sick Children, Great Ormond St., under Dr. Angel Money. Leave to refer to it was kindly given by the Dean, Dr. F. G. Penrose.	M. 8 $\frac{3}{4}$	Left.	Sarcoma.	In brain.	No; no jaundice.	Inferior vena cava compressed, not thrombosed. No ascites, no peritonitis, no œdema of legs. Symptoms chiefly cerebral; vomiting, headache, optic neuritis.
26	.....	Royal College of Surgeons Museum, London, No. 3518 K.	F. 32	Right.	Carcinoma, composed of elongat'd alveoli filled with large granular epithelial cells; the alveoli are separated by capillary vessels and a very scanty stroma.	Liver, aortic lymphatic glands.	.....	Growth projected through capsular vein into inferior vena cava. Face and extremities so thickly covered with hair that a razor had to be used.

ANOMALOUS POSITIONS OF THE COLON;

WITH REPORT OF A CASE DISCOVERED BY EXPLORATORY OPERATION.

BY JOHN B. SHOBER, A.M., M.D.,

OBSTETRICIAN TO THE PHILADELPHIA HOSPITAL; GYNECOLOGIST TO THE HOWARD HOSPITAL;
ASSISTANT SURGEON TO THE GYNECEAN HOSPITAL.

ON September 11, 1897, at Bar Harbor, Maine, E. B., aged thirty-six years, first consulted me in regard to his health. He was extremely despondent and melancholy; and stated that for weeks he had eaten very little, barely enough to keep alive, sometimes eating only once a day; that he was losing strength rapidly, and that, owing to increasing discomfort in the lower part of the right side of the abdomen he feared that there might be some disease of the appendix.

For sixteen years he has been an invalid. He is over six feet tall, and weighs about 140 pounds. He is much emaciated, of dark, sallow complexion, and melancholy expression. He has never had any serious acute disease. No tuberculosis in his family. His father died about a year ago of sarcoma of the superior maxillary bone. His mother died of apoplexy in her sixty-sixth year. A brother and sister died of typhoid fever. One brother and two sisters are living and healthy.

At various times he has been treated for supposed disease of the liver, for chronic indigestion, for weak heart, for neurasthenia, nervous prostration, etc. He does not remember ever having had an attack of abdominal inflammation. He was always delicate as a child, but until his sixteenth year he enjoyed fairly good health. About that time he broke down with what was called nervous prostration, and he has never been well since.

For sixteen years past he has been conscious of discomfort, weight, uneasiness, and occasional sharp, sudden pain all through the region below and to the right of the umbilicus. He always eases himself in this region as much as possible. These feelings are becoming more and more intense, with at times a dull, heavy, aching pain and a feeling as if a mass as large as an orange was there. Often there is distention, and he passes much flatus. His general symptoms are those of malnutrition and auto-intoxication from faulty assimilation of food. Often his digestion is so poor that for days he eats almost nothing. He then becomes so prostrated and weak that he can scarcely walk. Such is his present condition. At these times his pulse is weak and slow (58 or 60), and there is a dull and heavy feeling in the head as though a weight were on it. He recovers slowly from these attacks, and is able to take moderate exercise and even ride a bicycle. The discomfort and pain in the right iliac region has increased considerably during the past six months. The bowels, though seldom constipated, are usually costive, and he uses glycerin suppositories for relief. He is very despondent, and says that life is not worth living; that he would be willing to lose his right arm if thereby his general health could be improved.

Physical Examination. He is extremely emaciated, sallow, and anæmic, with an expression of deep despondency. The tongue is tremulous, large, flabby, and slightly coated. Lungs normal. Action of heart weak and slow (58). Valvular sounds normal; no organic lesion.

Liver, spleen, and kidneys are apparently normal. On examination of the abdomen there is noted slight tension of the right rectus muscle and resistance over the caput coli. The colon is somewhat distended. Deep pressure at McBurney's point causes him to wince and produces decided pain. A mass in the region of the vermiform appendix can be palpated, and feels about the size of a small cigar, pointed south. Pressure upon it causes pain. The urine was examined a few days later. It was normal as to color and reaction, contained no albumin or sugar, but there was an excess of urates and a few oxalates.

The patient was told that some unusual condition existed in this region of his abdomen, with a possibility of chronic disease of the appendix, and a consultation was requested.

On September 13th Dr. L. Bolton Bangs, of New York, saw the patient with me. He confirmed the diagnosis of possible chronic appendicitis, and advised exploratory operation. The patient was told that the diagnosis was very uncertain; that it was clear that some abnormality existed which justified exploration. He consented, and arrangements were made to have the operation performed in Philadelphia as soon as possible after our return.

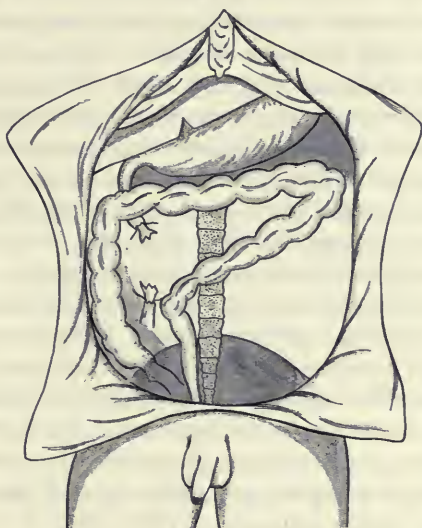
On September 27th he was admitted to a private room at the Howard Hospital, Philadelphia, and on the following day Dr. Edward Martin saw him in consultation. The same opinion was given as in the consultation with Dr. Bangs.

On September 29th I operated, with the assistance of Dr. Martin. The usual incision for appendectomy was made. The caput coli was not in its usual position. It was found dipping over the brim of the pelvis on the right side, becoming lost below the peritoneum, so that the appendix was entirely subperitoneal and could not be located. The ascending colon took its usual course. Loops of large intestine, presumably transverse colon and the first portion of the descending colon, occupied the upper portion of the abdominal cavity and covered the small intestine. These loops could be readily drawn down into the abdominal wound. The middle portion of the descending colon was found to cross the vertebral column obliquely from above downward, and from left to right, thus causing the sigmoid flexure to enter the pelvis on the right side of the promontory of the sacrum between it and the first portion of the ascending colon, thus it occupied the normal position of the appendix, and it was the abnormally placed sigmoid which had been felt by palpation and which caused pain on pressure. (See Fig. 1.) In order to prove the anomalous position of the sigmoid at the operation, an assistant nurse was instructed to pass a long rectal tube per rectum. It was passed six or seven inches, and was found to enter the sigmoid which was held between the fingers immediately below the abdominal wound. This would have been impossible had the sigmoid occupied its normal position. The ileo-colic juncture was sought for, but could not be located. The lower portion of the ileum, however, was traced to the anterior fold of the mesocolon, about one inch above the brim of the pelvis. It could not be traced further, as the mesocolon at this point was short and merged into the peritoneum lining the false pelvis. Thus, in order to have found the caput coli and the appendix, it would have been necessary to have opened the peritoneum posteriorly and to have performed an extensive dissection. This course was considered unjustifiable, as there was no evidence of trouble with the caput

coli or of the appendix other than their anomalous positions, and sufficient abnormality had been found to account for the state of the patient's health.

The abdominal wound was closed as quickly as possible with buried catgut sutures in layers and subcutaneous catgut for skin.

FIG. 1.



Convalescence from the operation was uninterrupted, except that on or about the tenth day superficial suppuration occurred in the wound, which required almost daily dressing for several weeks. At the end of this time there was firm, strong union. The following is a note from my case-book on November 11, 1897 :

"During convalescence the patient absolutely refused to take any kind of treatment which was advised. He has been for a long time and is still in a state of nervous prostration. He is decidedly neurasthenic and a hypochondriac. Dr. John H. Musser has seen him several times in consultation, with a view to outlining some form of treatment which might meet the mechanical problems of this most unusual case. We find it impossible to do anything with him. He positively refuses to take advice."

In contradistinction to those cases in which the caput coli is found to occupy high positions in the abdominal cavity, such as the right lumbar and hypochondriac regions, and the many reported cases of imperforate anus and other cases of obliteration of one or more portions of the colon, we have to look upon this case, it seems to me, as one of over-development of the colon. It is well known that in early foetal life the colon is so arranged that it forms almost a straight canal from above downward, and that in the early months the caecum describes a curve downward and to the right until it finds its place in the right iliac fossa at about the end of the fourth month of pregnancy. At the same time

other developmental changes are taking place at the distal end of the colon which result in the formation of the rectum and anus. When this process of development is interrupted either by reason of peritonitis in the foetus, causing adhesions, or by reason of some other cause, the normal development may be permanently arrested, or at least retarded, thus resulting in the abnormalities alluded to above. In many of the reported cases of arrested development have been found scars of the peritoneum, bands and adhesions, and even membranes separating different parts of the intestines from each other. These seem to be indications of a peritonitis occurring in the foetus, and they have been considered the causative agents in the arrest of development. The above case, on the other hand, is one in which the cæcum has been drawn down into a lower position in the abdominal cavity than it should normally occupy, as in a case reported by Turner,¹ carrying with it the ileo-colic juncture as well as the vermiform appendix. It is also to be remarked that it seems to have developed between the layers of the mesentery and behind the peritoneum, thus being bound down in such a manner as to have very little play. Under such circumstances it is easy to understand that there would be a constant tendency to retention of feces, and even impaction in the caput coli. By reason of its bound-down position the cæcum would have great difficulty in evacuating itself. Again, these cases of elongated and coiled sigmoid flexures seem to me to be the result of overdevelopment of this portion of the colon. This may also be said of those cases of lengthened transverse colon and the cases in which the descending colon ascends again before descending into the pelvis on the right side, or in the middle line, or normally on the left side. The question as to whether such conditions of overdevelopment are congenital or acquired during infancy or early childhood is one which cannot be readily decided. The writer is inclined to believe that in some cases these abnormalities may reach their full development in the foetus, but that in many instances the process of overdevelopment goes on after birth, extending over periods of years. In support of this belief it is only necessary to remember that a very large number of cases have been reported in adults; in people who have been enjoying good health until some such cause as a gravid uterus or an obstinate constipation with impaction has caused an obstruction resulting in fatal ileus. Again, many of these cases have died of some other disease, as typhoid fever or pleurisy.

Depending upon the extent and character of the abnormality, these cases must suffer more or less from a sluggish action of the bowels and have a tendency to constipation, and, therefore, must be in constant danger of obstruction.

¹ Edinburgh Med. Journ., 1863-64, vol. ix. pp. 110-116.

When a condition exists such as has been described in the case above reported, it is easy to understand how difficult it would be for the colon to empty itself normally. There is a constant tendency for feces to be retained in the caput coli, and the descending colon as it crosses the vertebral column in its oblique descent from left to right would present another seat of possible obstruction. The patient declares that for many years past he has had a feeling of uneasiness, weight, and fulness in all that region below the umbilicus and to the right of the median line, and that at times he has felt as though a mass were there as large as an orange. At these times all his symptoms of ill-health are intensified, and he becomes so prostrated that he is scarcely able to walk; his appetite is entirely destroyed, so that food disgusts him; he has a feeling of weight on the top of the head, the complexion becomes sallow and muddy; he sinks into a condition of great despondency, so that life does not seem worth living. These are the symptoms of auto-intoxication from retained feces, and the abnormality discovered sufficiently accounts for the condition.

INDICATIONS FOR TREATMENT WHICH SUGGEST THEMSELVES. Regular mechanical unloading of colon by high enemas; massage; electricity, local and general; diet (experimental); blood-making food and tonics, such as carnogen and pepto-manganate of iron, aids to digestion, like pepsin, pancreatin acids, etc.; regulated exercise and fresh air.

Eighteen Cases in which the Sigmoid Flexure and the Rectum were Found on the Right side of the Pelvis.

J. Chiene,¹ among a number of interesting cases of congenital anomalies of the intestine found in the dissecting-room, records two in which the sigmoid flexure was on the right side.

1. A male. The sigmoid flexure passed across to the right iliac region, where it was tied down by the peritoneum before it entered the pelvis to the right of the middle line.

2. A male. The cæcum and ascending colon were largely dilated and their coats thinned. They possessed a large mesentery, and were freely movable. The sigmoid flexure crossed to the right side and was tied down in the right iliac fossa before it entered the pelvis on the right side of the middle line.

3. W. Gruber² reports several abnormalities of the colon, the third being a case where the descending colon crossed the vertebral column obliquely, and the sigmoid and rectum thus descended on the right side of the pelvis. (Similar to case of E. B.)

4. He records still another where there was shifting of the rectum to the right side, the sigmoid descending into the pelvis over the promontory of the sacrum.

5. J. Reid³ quotes a case recorded by Annesley, that of a boy seven

¹ Journal of Anatomy and Physiology, London, 1867-69, vol. ii. p. 14.

² Arch. f. path. Anat., etc., Berlin, 1865, vol. xxxii. p. 94.

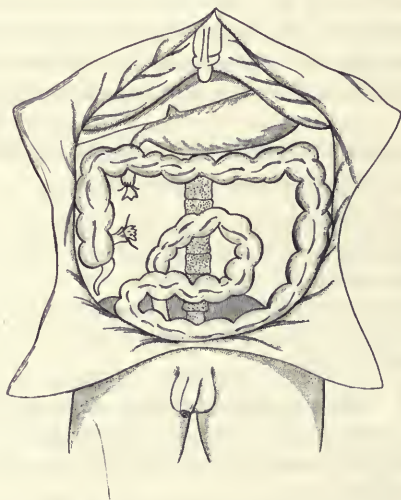
³ Edinburgh Medical and Surgical Journal, 1836, vol. xlii. pp. 70-74.

years old. The caput cæcum was found lying in the right lumbar region; from this it followed its usual course, until it reached the left iliac fossa, where it crossed the spine to the right iliac fossa; here it turned upon itself and passed into the pelvis upon the right side. The trunk of the interior mesenteric artery, after sending off the left colic and sigmoid branch, passed to the right of the spine, accompanying the intestine. The testicles had descended.

6. A Buchanan,¹ in an article entitled "Fatal Cases of Obstruction and Enormous Distention of Belly arising from a Peculiar Conformation of the Colon," describes a case in which the colon observed its usual course as far as the left groin, when it again ascended as high as the transverse arch immediately under the liver, and then, turning to the right side, it descended into the pelvis.

7. Another case was that of a man whose bowels had been obstinately constipated for some time. The patient died eight days after admission to the hospital in agony from distention. The sigmoid flexure was much larger than usual, lying chiefly in the umbilical region, in front of the small intestines, having its ascending portion on the left side and its descending portion on the right. The obstruction was due to a twist of the intestine where the colon terminates in the rectum (Fig. 2).

FIG. 2.



8. J. Von Droste-Hulshoff,² in 1829, relates an instance of a girl, eleven years old, who died from obstruction of the intestines. The autopsy showed that the sigmoid flexure crossed into the right iliac region over the body of the last lumbar vertebra, and then, curving to the left, descended into the pelvis on the right side. The proximal portion of the loop lying over the beginning of the rectum caused obstruction by pressure.

¹ London Medical Gazette, 1839, vol. ii. p. 639; 1840, vol. ii. pp. 99, 143.

² Abhandl. u. Beob. d. aerztl. Gesellsch. zu Münster, 1829, vol. i. pp. 118-126.

9. T. Thompson¹ saw a male infant, fifteen months old, who died after an attack of pneumonia followed by pertussis. On opening the abdomen only small intestines could be seen. The whole of the colon was found behind the small intestines, and the sigmoid flexure crossed into the right iliac region over the promontory of the sacrum, and there descended into the pelvis on the right side.

10. H. F. Vickery² records a case of a patient who is living to-day and has obtained life insurance without difficulty. There is complete transposition of the viscera. On examination, the heart, liver, and spleen were found to be transposed from their normal positions to the opposite side of the body respectively. On inflation, the stomach was found lying toward the right side instead of the left side, and air injected per anum distended the colon on the right, as if the descending colon were upon that side. The left testicle, as in other men, hung lower on the left side, and he was right-handed.

11. E. E. Maddox³ records the post-mortem of a male subject. For some inches below the splenic flexure the descending colon occupied its usual position, but thence with an abrupt curve it passed across the abdomen to the right side, and lay in this horizontal part of the course, behind the small intestines and the origin of the mesentery, bound by peritoneum to the aorta and vena cava near the termination of the former. It was then continued into an ample sigmoid flexure in the right iliac fossa, which lay in front of the cæcum, and was invested by peritoneum derived from the covering of that viscus through a mesocolon about two inches wide. The rectum crossed down the right side of the sacrum, and but for this reversal of position bore its normal relation to the peritoneum.

This abnormality must from its nature have been congenital, and differs essentially from the not infrequent displacements of the sigmoid flexure to the right, attributed to the exceptional length of the mesocolon, and in which the descending colon must of necessity lie *in front* of the small intestines, to reach the right iliac fossa. Their occurrence must be viewed as more or less accidental, and due to the extreme license afforded to the sigmoid flexure by the unusual length of its tether.

12, 13. Gruber⁴ describes post-mortems of two adult males, in both of whom the sigmoid flexure entered the pelvis on the right side of the promontory of the sacrum. One case died of typhoid and the other of typhus fever.

14. J. Barton⁵ reports the following unusual arrangement of the large intestine discovered in the body of an old male in the dissecting-room. The ascending and transverse colon were in their normal position, but their peritoneal attachments were so long that they could be drawn into any region of the abdomen. The descending colon was normal until it reached the level of the second lumbar vertebra. Here it turned across the abdomen, attached to the under surface of the mesentery, to the right iliac fossa; the intestine ran up in the right lumbar region and touched the under surface of the right lobe of the liver; here a short band of

¹ London Medical Gazette, 1836, vol. i. p. 557.

² Boston Medical and Surgical Journal, January 18, 1898, p. 34.

³ Journal of Anatomy and Physiology, London, 1882-83, vol. xvii. p. 403.

⁴ Arch. f. path. Anat., etc., Berlin, 1885, vol. cix. p. 497.

⁵ Transactions of the Royal Academy of Medicine, Ireland, 1889, vol. vii. p. 392.

adhesion attached it to the liver. It then turned down again to the outer side of the ascending coil into the right iliac fossa, and passed into the pelvis well to its right side, and so on to the anus.

15. W. S. Melsome¹ reports four cases of unusual position of the sigmoid flexure, which are interesting in connection with the case reported. In one of them the rectum was situated in the right side of the pelvis.

16. A. Farenholt,² while operating on a cadaver in the Bellevue Hospital Medical School, found the cæcum in the right hypochondriac region, in close proximity to the gall-bladder. The appendix was normal and pointed downward. Both structures were held in their place by the mesentery. The sigmoid flexure occupied the usual position of the cæcum on the right side. There were no peritoneal adhesions present.

17, 18. D. E. Mundell³ reports two cases in which the sigmoid flexure occupied the right iliac fossa.

In illustrating the operation for appendicitis on the dead subject to the class in operative surgery the following condition was found: the usual site of the cæcum was occupied by the sigmoid flexure, which, passing transversely across the body of the fourth lumbar vertebra, formed a bend in the right iliac fossa, and then ran down into the pelvis on the right side. The cæcum was high in the lumbar region, being on a level with the upper border of the fourth lumbar vertebra.

The next case he met in the dissecting-room. The sigmoid circled the left iliac fossa, lying close behind Poupart's ligament, then ran back along the left margin of the pelvis, across the sacrum to the right side, and then down into the pelvis. No investigation was made as to the situation of the appendix.

Examples of Other Abnormalities and Malformations of the Intestines.

J. Abernethy⁴ describes an anomalous condition of the intestines in the body of a boy brought to him for dissection. The length of the colon was uncommon; having, as usual, ascended to the right hypochondrium, it was reflected downward even into the pelvis; it then reascended to the left hypochondrium, and afterward pursued its usual course. The duodenum, jejunum, and ileum, when detached from the body and extended, measured only two feet in length, while the extent of the large intestine exceeded four feet. The utmost length of the intestinal tube was little more than six feet, whereas it should have been about twenty-seven feet.

Behm⁵ reports a case of an infant in which the autopsy showed a general undeveloped state of the alimentary tract extending from the stomach, which had a capacity of only two drachms, to the descending colon, the lower portion of which was fully developed. The undeveloped portion was so narrowed as barely to admit a small sound throughout its length.

Cabot⁶ reports the case of a boy, thirteen years old, who died of per-

¹ Proceedings of the Anatomical Society of Great Britain and Ireland, London, 1893, p. 30.

² Boston Medical and Surgical Journal, 1894, vol. cxxxi. p. 427.

³ Dominion Medical Monthly, Toronto, 1895, vol. v. p. 39.

⁴ Philosophical Transactions, London, 1793, pp. 63-65.

⁵ Wochen. f. d. Ges. Heilk., Berlin, 1838, vol. iv. p. 698.

⁶ Boston Medical and Surgical Journal, 1861, p. 546.

forative appendicitis. The arch of the colon was parallel with the ascending portion, being pushed aside by a soft, resonant, elastic tumor which occupied the left side and centre of the abdomen. This proved to be the wall of a sac formed by a separation of the layers of the mesentery which usually constitute the transverse mesocolon. This contained the greater part of the small intestine, and was evidently congenital, as the mouth of it was two or three inches in diameter, and the margin smooth and rounded. The intestine itself was unchanged. The other organs were normal.

J. Chiene¹ relates a case found in the dissecting-room, in which the duodenum passed upward into the right hypochondrium, and then sweeping downward into the right lumbar region, became continuous with the jejunum without crossing from right to left in front of the aorta. Nineteen feet of coils of small intestine occupied the right and middle regions of the abdomen. The cæcum was not lodged in the right iliac fossa, but lay loose in the cavity of the abdomen. A mesocæcum, five inches broad, directly continuous with the mesentery, passed to the surface of the last lumbar vertebra. The colon, twisted on itself and not subdivided into an ascending and transverse portion, lay to the left of the middle line, and was continuous with the descending colon and sigmoid flexure, which occupied their proper regions.

Also in the case of a female, the cæcum was situated in the right hypochondriac and lumbar regions; the right iliac fossa was covered by the parietal peritoneum, and the ileum passed through it to join the cæcum.

E. Fairland² reports the following interesting condition found at autopsy following an unsuccessful left lumbar colotomy: A bifurcation of the intestine commencing one and one-half inches from the pylorus. One portion, which was probably the small intestine, ended in a blind pouch. The other portion was of smaller diameter, also ending in a blind sac from which sprang a rudimentary vermiform appendix and a pipe-like portion of gut terminating at the cul-de-sac forming the rectum.

W. Gruber³ describes five cases of anomalous position of the intestines, in one of which the descending colon crossed the vertebral column obliquely, then turning again in its axis, recrossed in the opposite direction, and the sigmoid and rectum entered the pelvis in the normal position.

In another place he reports⁴ a case of fixation of the descending colon by means of a broad mesocolon in front of the lumbar vertebræ, the upper part of the sigmoid being in front of the sacrum.

Hurd⁵ reports a case of imperforate anus. The sigmoid flexure opened into the prostatic portion of the urethra. The child lived fifteen months, feces passing through the urethra. Such cases seem to be a reversion to a primitive type of vertebrate life.

J. Reid⁶ has contributed a very valuable paper on the subject, and reports a case of an individual who died of some thoracic disease. Autopsy showed the caput cæcum was placed in the upper part of the

¹ *Journal of Anatomy and Physiology*, London, 1867-68, vol. II. pp. 14-18.

² *British Medical Journal*, 1879, vol. I. p. 851.

³ *Arch. f. path. Anat., etc.*, Berlin, 1865, vol. xxxii. p. 94.

⁴ *Oesterr. Zeitschr. f. prakt. Heilk.*, Wien, 1865, vol. xi. p. 269.

⁵ *Boston Medical and Surgical Journal*, 1885, vol. cxlii. p. 294.

⁶ *Edinburgh Medical and Surgical Journal*, 1836, vol. xlv. pp. 70-74.

left lumbar region; the colon first passed through the left lumbar region to the lower part of the left iliac fossa, it then turned up again to the left lumbar region, the ascending portion lying internal to and nearly in close apposition with the descending portion; in the left lumbar region it again formed an acute angle and again traversed the left lumbar region and left iliac fossa, close to and internal to the ascending portion, and then passing over the sacro-iliac synchondrosis it terminated as usual in the rectum.

He also mentions another case in which coils of large intestine with sharp flexures occupied the left lumbar region. At one of these angles there was an obstruction from which the patient died. The malposition in both cases was the original formation of the parts and not the effect of disease or any other agency.

In the same paper Dr. Reid comments as follows:

"Beside the cases of transposition of the whole of the viscera, various irregularities in the position of the large intestines are mentioned by practical authors and by those engaged in elucidating the development of the fœtus; some of these undoubtedly arising from original conformation, and others from disease. The most common of the former of these seems to depend upon the unusual length of the intestine, particularly of the transverse arch of the colon." He quotes Morgagni and Annesley as giving examples, also Dr. Wells¹ and Geoffroy-Saint-Hilaire. Reid goes on to say that the caput cæcum maybe placed higher than usual so as to lie in the right lumbar region or toward the umbilicus. Annesley gives one case in which the caput was found in the middle of the pelvis. The body was that of a female, who had died of pleurisy, in whom the caput cæcum was placed loose in the lower part of the pelvis, and the ascending colon was firmly fixed by the peritoneum in the right iliac fossa. The sigmoid flexure, after passing into the pelvis, turned upon itself at an acute angle, and re-entered the left iliac region, about the middle part of which it formed an acute angle and returned to the pelvis. All the abdominal viscera were quite healthy.

He goes on to say that in connection with the high position of the cæcum we may have the colon passing from the umbilical region down the centre of the abdomen, to terminate in the rectum. These are the more interesting, as they approach nearly to the position which the large intestine occupies in the first months of fœtal development.

Meckel² has ascertained that in the early months of utero-gestation the colon does not consist of ascending, transverse, and descending portions, as in the adult, but is nearly straight, and that it is only toward the end of the fourth month that the caput cæcum reaches the right lumbar region.

According to Serres, the position of the caput cæcum in the right iliac fossa is intimately connected with the descent of the testicle in the male and that of the ovary in the female. In those cases where the descent of the testicle has been arrested he has found that of the cæcum also arrested. According to Meckel, the descending colon describes a larger curvature in the left iliac fossa in the fœtus during the latter months of utero-gestation, so that its appearance in the adult is only the continuance of the arrangement peculiar to the fœtus at that period.

¹ Transactions of the Society for Improving Medical and Surgical Knowledge, vol. iii.

² Manuel d'Anatomie Générale, Descriptive, etc., tome ii.

Though many of the abnormal appearances in the adult can be beautifully and most satisfactorily accounted for by the arrestment of the development, yet there are others which as yet cannot be thus explained.

W. Turner¹ reports two cases of malposition of the cæcum:

1. Adult male. The cæcum occupied the right lumbar and hypochondriac regions. It was loosely attached by an extensive mesentery, which allowed it to be thrown across to the left of the median line. It passed immediately into the transverse colon; there being no ascending colon, its place was occupied by the terminal end of the ileum.

2. Aged female. The cæcum was misplaced downward, resting on the floor of the pelvis. Owing to this position, the lower end of the ileum also entered the pelvis and passed to the right side of that cavity to join the large intestine. The cæcum and as much of the ascending colon (about two inches) as was placed in the pelvis were completely surrounded by peritoneum, so that they possessed considerable mobility, and could be thrown over to the left of the pelvis, or even drawn upward into the cavity of the abdomen proper. In this case the development, instead of being arrested, was excessive, the cæcum and ascending colon passing through their proper regions to one beyond.

This case is of particular interest in connection with the case which I have here reported, in which, it will be remembered, there was an overdevelopment of the cæcum, as shown by its occupying the true pelvis.

J. M. Alexander.² Case of double colon in a boy, aged eight years. This case proves to be not a true double colon, as the title implies, but a reduplication of the colon upon itself by a sharp flexion at the position of the sigmoid, ascending to the right of the descending colon eleven inches, and descending again to the right and joining the rectum. The whole colon measured six feet.

A. Buchanan³ remarks that the colon is more subject than any other part of the intestinal canal to vary in length and in mode of disposition.

Upward of twenty examples of such variations will be found recorded in the works of Morgagni. The most common of these variations is that observed in the transverse arch of the colon, which, instead of running straight from right to left immediately under the liver and stomach, is inverted downward, so as to reach the umbilicus or even the urinary bladder. He goes on to cite various cases from Morgagni, among which was one in which the colon, after observing its usual course as far as the stomach, passed thence right down to the sacrum in front of the small bowels. Instances are not infrequent of the sigmoid portion of the colon deviating from its usual course. It sometimes passes from the left groin across the fundus of the bladder to the right groin, and thence, ascending and turning to the left, it goes over the top of the sacrum to form the rectum. A case is quoted from Morgagni in which the sigmoid flexure of the colon lay almost completely in the umbilical region of the abdomen. The following variety escaped the notice of Morgagni. The author states that it is rare in Italy, but may be more common among the inhabitants of the British Isles. Within a period of seventeen years he had observed several examples of this

¹ Edinburgh Medical Journal, 1863-64, vol. ix. pp. 110-16.

² Cincinnati Lancet and Clinic, 1880, N. S., vol. iv. p. 511.

³ London Medical Gazette, 1839, vol. ii. p. 639.

variety in Scotland. The first case he saw, in 1891; Dr. Hunter observed a similar case in 1831. (Case of right-sided sigmoid flexure already quoted.)

In another remarkable case, the colon, crossing from the left to the right groin, ascended parallel to the right colon, and then, turning to the left, descended near the mesial line of the body into the pelvis. Of the deviations from the usual conformation of the colon described above, those occurring at the proximal or middle portions of the intestine do not appear to be productive of any disease or inconvenience to the individuals so constituted. On the other hand, the deviations which occur at the distal extremity of the colon have been, in several instances, found to accompany a very severe disease which doubtless is produced by the faulty conformation. He relates a case, aged forty or fifty years, which died of obstruction with enormous distention. All kinds of purgatives had been used in vain. At autopsy the colon was found to observe its usual course until it reached the left iliac region, when it made a sweep to the right, passing behind the portio and returning across the lowermost lumbar vertebra; it then ascended until it came in contact with the transverse arch, when, turning to the right, it descended to the sacrum. The obstruction had taken place at the promontory of the sacrum, where the beginning sigmoid was pressed between the overlying fold of colon and the promontory. The second case was a female of forty years, of costive habit. Nine days previous to her admission to the hospital nothing had passed from the bowel, and the obstruction continued until her death, five days later. Autopsy showed an enormously distended colon. It followed its usual course to the left iliac fossa, and then ascended as high as the transverse arch, and, turning to the right, descended nearly in the middle of the line of the belly to form the rectum. There was also an incurvation downward of the right half of the transverse arch. At the termination of the colon in the rectum the intestine was observed to be twisted from left to right, and this was the cause of the obstruction.

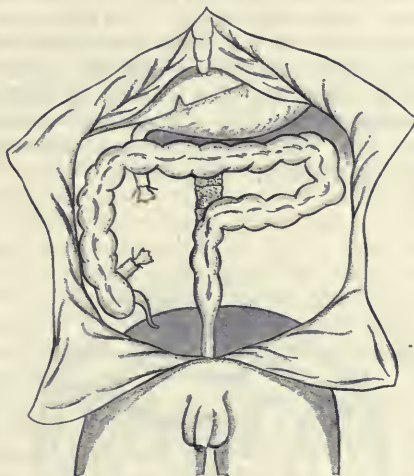
The third case was one of right-sided sigmoid flexion, already quoted.

In a subsequent paper¹ he reviews the subject of obstruction of the bowels the result of congenital or anomalous displacement of the colon, and adds two more cases from the literature of the subject. The first occurs in the *Sepulchretum Anatomicum* of Bonetus, the father of pathological anatomy, and we may, therefore, add of rational medicine. It is extracted from the observations of Tidicaeus, who flourished in the end of the sixteenth century. (Fig. 3.) A pregnant woman, who was a seamstress and worked daily from early dawn until late at night, became so constipated that just before her confinement she had not had a passage from the bowels for twenty days. Nothing relieved the incredible pain and swelling of her belly. Labor at length came on, and she was delivered of an immature, but living child. Notwithstanding the expulsion of the foetus, the belly did not in the least diminish in size. The bystanders thought that the belly would burst on account of the excessive tension. She died soon after her labor, and the autopsy showed the colon enormously distended with excrement and wind. The colon at that part where it descends from the left kidney turned to the right as far as the region of the umbilicus, under which, and situated between

¹ London Medical Gazette, April 17, 1840, p. 143.

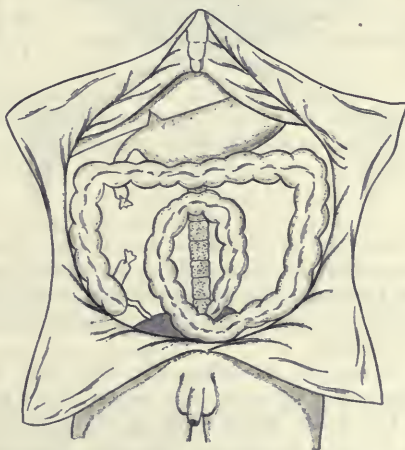
the tracts of the recti muscles, it was seen descending in the middle of the belly, in a straight line from the stomach. A twist in the lower part of the colon had taken place where it is continuous with the rectum,

FIG. 3.



thus causing the obstruction. Buchanan thinks that the obstruction was not due to the twist, but to the unusual position of the colon, lying between the promontory of the sacrum and the gravid uterus.

FIG. 4.



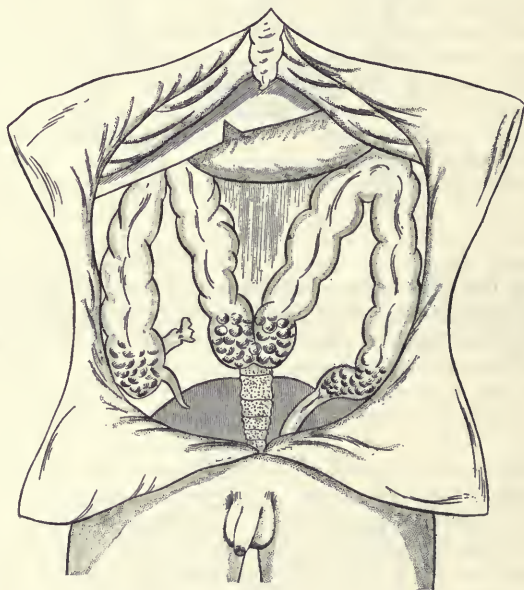
The other case was observed by Abercrombie,¹ of Edinburgh, in 1815. A man, aged sixty years, died of obstruction of the bowels. He had suffered twice with similar attacks. The sigmoid flexure crossed to the

¹ Edinburgh Med. and Surg. Journal, vol. xvi. p. 15.

right and in front of the bladder, then ascended toward the umbilical region, then, turning sharply to the left, descended beneath the first section of the sigmoid into the pelvis. The obstruction occurred at this point. (Fig. 4.)

C. F. Dressel¹ reports the case of a girl, nineteen years old, who died after great suffering from obstruction. The colon was enormously distended. The first portion of the transverse colon descended as far as the uterus, and then the second portion ascended again to the left hypochondrium, where it joined the first portion of the descending colon. The caput coli, the dependent loop of the transverse colon, and the sigmoid flexure were filled with masses of hard excrementitious matter, thus producing the obstruction. (Fig. 5.)

FIG. 5.



Esquirol² reports a case in which the transverse colon, after making a sharp curve in the right hypochondrium, descended perpendicularly in the middle line and entered the pelvis directly behind the pubis. The patient was an insane woman, aged twenty-eight years, who died from obstruction of the bowels.

D. S. Fiske.³ A case of an infant who died with imperforate anus. The child had been operated upon when twenty-four hours old, and died in a few hours. The colon, after running through its usual course to the left iliac fossa, formed the sigmoid flexure. From this point it passed into the pelvic cavity, and, ascending again, terminated in the pelvis of the right kidney, thus occupying the place of the ureter. The calibre

¹ Journ. de Chir. und Augenb., Berlin, 1833, vol. xix. pp. 664-668.

² Journ. Gén. de Méd. Chir. et Pharm., Paris, 1818, vol. lxii. p. 341.

³ Northern Lancet, Plattsburg, N. Y., 1853, vol. vii. p. 85.

of the intestine was not in the least diminished to the very point of attachment in the kidney.

J. Malden.¹ An adult female, died of ileus. The transverse colon descended from the right hypochondriac region to the right iliac, and then ascended again to the left hypochondriac region, whence it pursued its usual course.

H. Smith.² An infant died with imperforate anus. The colon was much inflated. It passed up on the right, and making a short turn across the umbilical region, terminated in a smooth rounded extremity or blind sac. There was a well-formed caput coli, but no appendix vermiformis. The small intestines were healthy and perfect.

The sigmoid flexure and rectum seemed not to have been formed, but upon examining the pelvis there appeared a tortuous gut not larger than a swan's quill, which could be traced along the left side of the spinal column, and which, passing through the pelvis, terminated in the anus.

W. Walters.³ The first born of twins died ninety-eight hours after birth. The surviving twin-sister was healthy, without any defect or malformation. At autopsy the left metacarpal bone and phalanges of the thumb were entirely absent, and the hand was bent upward upon the wrist at a right angle.

Six inches below the cæcum the colon terminated in a cul-de-sac. The terminating point of the colon was a little below the commencement of its transverse portion, and adjacent to this point it was found again commencing in a cul-de-sac, and extending thence uninterruptedly several inches to the sigmoid flexure. The whole extent of this portion was contracted almost to a cord, and was entirely empty. The rectum was also empty and contracted in its upper portion.

N. Dayabhai⁴ relates a case found at autopsy, in which the descending colon crossed obliquely downward from the splenic flexure to the caput coli in the right iliac fossa. From this point it turned straight across over the promontory of the sacrum to the left iliac region. Here it formed the sigmoid, which entered the pelvis normally.

The normal course of development of the intestines has been described by Professor Flower,⁵ and also by Professor Cleland.⁶ He says that a peritonitis occurring in foetal life by the formation of temporary or permanent adhesions could so modify development as to give rise to almost any deformity, arrest of development, or anomalous position. Old scars of the peritoneum are frequently found in these anomalous cases, and occasionally the bands and adhesions persist, as in a case reported by R. B. Young.⁷

B. Robinson,⁸ in an article entitled "Unusual Cæca in One Hundred and Thirty Autopsies," says: "The most impressive, unusual cæca are the excessively developed ones which lie on the pelvic floor or are turned toward the middle of the abdomen."

¹ Midland Medical and Surgical Reporter, Worcester, 1828-29, vol. i. p. 53.

² London Medical Gazette, 1840, vol. i. p. 789.

³ Medical Examiner, Philadelphia, 1855, vol. xi. p. 724.

⁴ Indian Medical Record, Calcutta, 1893, vol. iv. p. 286.

⁵ Medical Times and Gazette, 1872, vol. i. p. 291.

⁶ Journal of Anatomy and Physiology, May, 1868; May, 1870; April, 1883.

⁷ Ibid., London, 1884-85, vol. xix. p. 98.

⁸ Gaillard's Medical Journal, New York, 1895, vol. lxi. p. 98.

TWO ATTACKS OF TEMPORARY HEMIPLEGIA OCCURRING IN
THE SAME INDIVIDUAL AS THE RESULT OF THE USE
OF PEROXIDE OF HYDROGEN IN A SACCULATED
EMPYEMA (PLEURAL).

BY E. G. JANEWAY, M.D.,
NEW YORK.

THE following history of the development of two attacks of hemiplegia of temporary duration as the result of the use of peroxide of hydrogen in the sac of an empyema will, I trust, prove of interest as well as serve as warning :

Mr. B., forty-one years of age, a right-handed writer, was referred to me by Dr. Axtelle, of Waterbury, Conn. Two years previously he had developed a pleurisy on the left side, which had been aspirated. One and one-half years after this event a swelling developed in the left lumbar region, which bulged when he coughed. This Dr. Axtelle had incised four months preceding his visit to me, and found that it communicated with a sacculated empyema at the base of the left lung. After this the patient had used peroxide of hydrogen to irrigate the sac. On November 25th, three and a half months after the operation, two minutes after the injection of a wineglassful of the peroxide, as he noticed it to bubble inside, he felt very queer and, according to his wife, became unconscious for a second, and of a pale-greenish color. Immediately he found that his right arm and leg were numb and powerless. He did not lose the power of speech. This loss of power of the right arm, which was complete, and of the right leg, which was almost so, lasted for twenty-five minutes, and then passed away completely. After this he described himself as having felt as well as ever, except that he had been frightened by the occurrence.

Three days after this first attack he had an exactly similar seizure, except that he lost power in his neck also, his head dropped, and he had difficulty in breathing. The paralysis of the right arm and leg was again complete, and lasted as before—twenty-five minutes. On questioning, the fact was elicited that the sinus had so far closed that no air or fluid escaped after the introduction of the peroxide.

I examined Mr. B. sixteen days after the first of these spells. He then presented the healing incision and sinus in the left lumbar region. The physical signs on the left side were few and only to be made out by careful examination. There was some dulness in the lower part of the thorax ; on auscultation the respiratory murmur was feebler than on the right side. Only by the ear could adventitious sounds be heard over the above-described area near the vertebral column. Neither with the binaural stethoscope nor with the phonendoscope could they be elicited. These consisted in rather large liquid râles occurring during the act of coughing or during an inspiration following several short acts of coughing.

This is an illustration, to digress for a moment, of the fact of not infrequent occurrence, that those who trust alone to auscultation by

means of stethoscopes are liable to overlook or miss those indications of disease which are produced beneath the layer of normal, or nearly normal, lung tissue. On many occasions I have been able to detect a central pneumonia earlier by immediate than by mediate auscultation.

But to return to the thread of our story. At the time of the second examination, six days after the first, these phenomena had disappeared; only the slight dulness and the feeble respiratory murmur remained. On the occasion of this second visit the patient said that the discharge had ceased, and he felt that there was no accumulation within.

In this connection it may be of interest to recall to the members the case published by Leudet. This will be found with other cases of nervous phenomena developed in the course of an empyema, or more especially of lavage of the sac of an empyema, in the work of L. Bonveret on empyema, published in Paris in 1888. He has collected a series of cases which he has grouped under the head of embolic, slow paralytic, syncopal, and convulsive, following empyema, or more especially lavage of the sac, or the introduction of a tube in the sinus. This and the following are similar in most respects to the one whose history I have detailed.

Briefly, the facts of this case were: that a young man, twenty-one years of age, had a pleurisy of the left side, filling the pleural sac in ten days. At the end of a week two litres of serum were removed by thoracocentesis. Three days later a pleuro-bronchial fistula gave exit to a great quantity of pus. Four days after this a new thoracocentesis gave exit to a litre of cloudy and opaque liquid. At the end of four months an incision into the pleura was made and the sac was regularly washed with a solution of iodine. Gradually the sac diminished, and on several occasions it was necessary to dilate the fistulous tract. Thirteen months after the operation for empyema, while his mother, as she had been accustomed for a long time, washed the sac with a solution of iodine, having first introduced a new tube for one which had long remained in the fistula, the young man was suddenly seized with a general malaise, a sensation of numbness in the right side of the body, and an impossibility of speaking. The consciousness was not lost, and there was no convulsive movement. He knew that he could neither move a finger nor limb of the right side. Gradually the power of motion returned. Two months later a similar attack, though lighter, occurred. A third happened when the physician was himself washing out the cavity, which had become so retracted that it would hardly hold two-thirds of a wineglass of liquid. The physician essayed to measure the size of the sac by pouring in water. A resistance was experienced, and the tube was pushed out by the liquid. The patient rose, staggered, and his speech became embarrassed. He was placed in a horizontal position, with a pale face, the right hand and leg paralyzed, without power of speech. After fifteen minutes the speech returned, and a few moments later the power of movement of the right side. After this irrigations were continued for a year without further nervous accident.

So also this case, which was reported by Dr. L. Forgues, surgeon in the French Army, in the *Archives de Médecine et Pharmacie Militaires*, Paris, 1894, vol. xxiv., has somewhat similar features :

A soldier, twenty-two years of age, was admitted to the hospital, December 5, 1891, with broncho-pneumonia. Seven weeks later the beginning of pleurisy is noted, and twenty days afterward 700 grammes of pus were removed by aspiration. The operation for empyema of the left side after two days gave exit to 1300 grammes of pus. Daily lavage of the sac was performed at first, but afterward according to the requirements of the case. About three months after the operation, during the giving of a lavage, the surgeon being engaged in retaining the drainage-tube, which was very short and had given pain by pressure on the border of the wound, the patient suddenly lost consciousness, having a pale face, a cadaveric look, largely open eyes, and dilated pupils. The heart-beat and the respiration were suspended and the general sensibility was abolished. No convulsions nor contractions occurred. After the use of cold flagellation the heart's action and the respiration returned in about a minute. The patient had a vague expression for some moments, then recognized people around him, but had no knowledge of what had occurred. Four or five minutes later it was found that the right arm and leg were paralyzed. After twenty-five minutes power returned in the right leg, but it was three hours before the right arm could be used. Lavage was abandoned after this. On two occasions in the subsequent history the fistulous tract closed, but owing to accumulation of pus in the sac had to be reopened. The man finally recovered without another paralytic attack. In this case, as in the one which I have brought to your notice, though the hemiplegia was on the right side, there was no aphasia.

For attacks such as the three to which your attention has been drawn the most natural explanation would be to suppose that something had passed into the circulation and had produced an anæmia of the left side of the brain, or, more properly speaking, of a portion of this area. If we extend the study, however, and include those cases in which convulsions have also occurred, these have in certain cases been considered to be dependent on embolism, but a difficulty has been encountered in the cases which terminated fatally, and after careful search no satisfactory evidence of embolism has been found at the autopsy.

So far as a rather hasty examination of the literature is concerned, the three cases here recited are the only ones obtainable in which collapse and temporary hemiplegia have been the sole phenomena. In view of the fact above mentioned, that embolism could not be proven, the theory has been advanced that such seizures as had collapsed with subsequent convulsive attacks—the pleuritic epilepsy of some writers—could best be explained by invoking reflex action, and by supposing that a contraction of the cerebral arteries or an inhibition or excitation of the cerebral cortex was the occasion of the untoward nervous phenomena, with the additional explanation that in cases in which paral-

ysis existed afterward hemorrhages had occurred. But such explanation will not avail for the three cases here narrated—hemiplegia following or, more rightly, associated with collapse. It is a little singular that in these three cases, all with right hemiplegia, only one had aphasia. Hence, under the reflex theory, a narrower area of arterial spasm or cerebral inhibition must have been involved in two cases than in the case of Leudet. The idea which has been formulated, that intoxication is responsible for such conditions, would not be tenable so far as peroxide is concerned, nor does a study of the others enable one to be satisfied with such a theory.

To my mind, the phenomena are best explained by supposing the hemiplegia to be due to an embolism, but of such a nature as to soon disappear. The only substance capable of thus acting would be either air or gas. In the case which I have narrated, as in the others, the attack has occurred when the conditions were such as to produce some pressure within the sac; by liberation of oxygen from peroxide in this case; by measuring size of sac, Leudet, once; by change of tube with lavage, Leudet, once, and, case of Dr. Forgues, of pressure to hold tube in place with lavage. The question which has occurred to me is, Do not the events point toward the possibility that under the conditions air or gas may have found entrance into the radicals of the pulmonary veins through stretched or torn granulation tissue, helped by a forcible inspiration at the time of the accident? Air embolism barely possible, oxygen embolism may be the solution which we seek to explain these cases. Oxygen could only be the agent when peroxide had been used, as in the case recorded. It can, of course, be objected that air, and more particularly oxygen, would either be rapidly absorbed or else kill by its accumulation in the heart. We are, however, concerned in these cases about too small an amount to bring about the latter result. It may be well to remind the adherents of the reflex theory that in the case recorded by Leudet the lavage was continued for a year after the last attack without recurrence. We may well ask what has become of the sensitive nerve so susceptible in provoking reflex.

As regards collapse alone, it is possible that it can be produced as the result of a reflex influence. It seems to me that a careful examination of the history of certain convulsive cases, especially those followed by, or rather associated with, hemiplegia or paralysis, strongly suggests something sent by the circulation to the brain, possibly some of the injection fluid or pleural contents by the aspiration influence, causing capillary embolism.

Shortly after meeting this case I found an article by Prof. Lewin in the fortieth volume of the *Archiv für experimental Pathologie und Pharmacologie*, entitled, "About the Penetration of Air from the Bladder into the Heart and the Path of its Passage."

Prof. Lewin, in this article, describes experiments on animals in which death was produced by injecting air into the urinary bladder, thus producing air emboli. The air entered the venous system through the pelvis of the kidney, and was observed in the vena cava and aorta by means of a laparotomy previously performed. The air could also be heard to enter the renal vein and be made out in the heart during its continued activity following the death of the animal. Prof. Lewin thinks that the air penetrates preferably by the lymphatics into the vein by preformed paths, not necessarily through torn openings.

Such a case is suggestive in connection with the theory which has occupied us.

GASTRIC SYPHILIS, WITH THE REPORT OF A CASE OF PERFORATING SYPHILITIC ULCER OF THE STOMACH.

BY SIMON FLEXNER, M.D.,
OF BALTIMORE.

(From the Pathological Laboratory of the Johns Hopkins University and Hospital.)

CHIARI opens his paper on "Gastric Syphilis," contributed to Virchow's *Festschrift* in 1891, with the following remarks: "Although we are to-day sufficiently informed of the pathological changes caused by syphilis in most of the organs of the human body, and, thanks to the famous investigations of Virchow, we are able, in spite of our ignorance of the specific syphilitic virus, to identify the anatomical lesions of the disease, yet there are a few organs respecting which our knowledge of their syphilitic affections is not at all complete. To these latter organs belongs the stomach."

Chiari,¹ in his critical review of the reported cases of syphilis of the stomach up to the time of his publication, accepts as conclusive only those of Klebs, Cornil and Ranvier, Weichselbaum, and Birch-Hirschfeld. I shall follow Chiari in accepting these and rejecting the other reported instances, with the exception of Wagner's case, and I shall find in the meagre literature of the subject, especially in the English language, justification for the publication of the report of the present instance.

The case reported by Klebs² occurred in a man who showed at the autopsy, besides an ulcer of the stomach, numerous ulcers and cicatrices of the skin, fresh ulcers of the pharynx, gummata of the lungs and liver, and ulcerating gummata of the intestine. He describes the gastric lesion somewhat as follows: The ulcer was situated on the pos-

¹ Ueber Magensyphilis. *Festschrift*, Rudolph Virchow, 1891, ii. 297.

² *Handbuch der pathologischen Anatomie*, 1869, i. 269.

terior wall near the lesser curvature, two inches from the cardia. The mucous membrane was the seat of a circular erosion the size of a franc-piece, which resembled strongly similar ulcerations of the base of the tongue. The remaining tissues of the stomach were thickened in this place; the serosa especially showed a sharply-circumscribed, smooth, tendon-like thickening, which, in the region of the base of the ulcer, presented a variegated yellow appearance. The diagnosis was confirmed by microscopical examination.

Cornil and Ranveir¹ report the case of a woman, aged thirty-nine years, in whom gummata were found in the liver and stomach. There existed in the stomach several flat tumors, occupying the lesser curvature in the region of the pylorus. These were about 5 cm. in width and 12 mm. in depth, and the infiltration, having the characters of gumma, involved the mucous membrane, submucosa, muscularis, and even the serosa, which was thickened.

The case of Weichselbaum² was in a man, aged twenty-five years. The immediate cause of death was erysipelas. Syphilitic lesions existed in the cranium, nose, pharynx, larynx, liver, and stomach. The stomach exhibited a contracted cicatrix and two ulcers. The latter were on the posterior wall, above the greater curvature, and their bases were composed of cicatricial tissue. It is probable, but not certain, that the ulcers and cicatrix had originated in gummata.

Birch-Hirschfeld³ has encountered four cases. They are as follows:

One was a woman, aged forty-five years. The syphilitic infection dated from six years before her death; for four years she had suffered from gastric symptoms. At the autopsy were found (1) a gumma of the liver the size of the fist, (2) in the anterior wall of the stomach, near the pylorus, an oval, yellow, firm plaque, 8 cm. long, showing slight ulceration. The base and edges consisted of firm cicatricial tissues, and the infiltration occupied mucosa and submucosa. The bloodvessels were obliterated.

The second case was a man who exhibited gummata of the lymph-glands, jejunum, and stomach. The last was of the nature of an ulcer, situated at the cardia, the edges of which were dense and gummatous, the base clean.

The third instance was a male, aged thirty-five years, infected four years previously, in whom were found gummata in the bronchial and mediastinal glands and small intestine, cicatrices in the liver, and an ulcer, showing gummatous edges, affecting the lower end of the œsophagus and extending into the stomach. These three cases occurred in adults, presumably in all in consequence of acquired syphilis.

¹ Manuel d'Histologie pathologique, 1884, ii. 296.

² Syphilitisches Geschwürs im Magen. Ber. d. Rudolfsspitales in Wien, 1833, 333.

³ Lehrbuch d. patholog. Anatomie, 1887, ii. 518, 537, 589.

The fourth case of Birch-Hirschfeld was congenital in origin, and was a newly-born child which presented lesions of skin-syphilis and gummata in the liver and lungs. The pars pylorica ventriculi contained an elevated infiltration the size of the palm of the hand, white in color, and of firm consistence, consisting of a granulation tissue developed in the submucosa and mucosa. The granulation tissue was rich in epithelioid cells and contained bloodvessels with thickened walls. Birch-Hirschfeld is of the opinion that the tumor was syphilitic in origin.

Chiari¹ paid especial attention to the occurrence of gastric syphilis, and in 243 cases, which showed at autopsy anatomical lesions of syphilis, he found two of undoubted gastric lues. The 243 cases included 145 of hereditary and 98 of acquired origin. One of the cases of gastric syphilis was of the inherited and the other of the acquired form.

The case of acquired syphilis occurred in a man, aged twenty-three years. The clinical diagnosis was tuberculosis pulmonum, syphilis, and gastro-enteritis catarrhalis. The luetic infection dated from two years ante mortem. During the last year of life the patient had passed through an attack of syphilitic iritis and had had severe gastric symptoms. There was a large cicatrix on the glans penis. Gummata were present in the right lung, liver, kidneys, and intestines. The lung (right) and intestines showed lesions of tuberculosis. In both situations they were distinguishable from the syphilitic lesions. The *stomach* showed a chronic catarrhal condition in the region of the pars pylorica. In the region of the posterior wall, occupying the right side, and extending from the lesser to the greater curvature, there existed an almost circular loss of substance, 10 cm. in extent, that gave the impression of a peptic ulcer. The ulcer had perforated the coats of the stomach in its central part, which was prevented from communicating with the peritoneal cavity by adhesions with the pancreas, the transverse mesocolon, and the lower part of the duodenum. Other infiltrated areas existed on the anterior wall near its middle. These projected above the surface and, upon microscopical examination, they agreed with the syphilitic plaques in the intestine, with each other, and with the thickened edges of the ulcer. They are to be regarded as gummatous infiltrations, of which one had become ulcerated.

The instance of hereditary syphilis was in a boy, aged three weeks.² There were macular-vesicular exanthem, pneumonia alba, gummatous cholangitis and cholecystitis, gummatous plaques of the small intestine, osteochondritis syphilitica, and elevated plaques in the stomach. The

¹ Op. cit.

² Lues hereditaria mit gummoser Erkrankung des gall-leitenden Apparates und des Magens. *Prager medic. Wochenschrift*, 1885, p. 47.

general gastric mucous membrane was slightly injected; at several points it was thickened, pale yellow in color, remarkably smooth, and protuberant. The thickening involved all the tissues, which, on section, presented a uniform fibroid character. In some of the plaques central ulcerations existed. In all, five such growths were discovered. The microscopical examination showed a granulomatous tissue spreading from the submucosa into the other coats. A thick infiltration about the bloodvessels was noted. Necrosis was absent; but the structure of the gastric plaques agreed with the corresponding formations in the intestine and the nodules in the liver.

The next three reported cases are of the inherited form, and also emanate from Chiari's laboratory. Bittner¹ describes these cases, which arose within the period of one year. The first was a male child, which lived two and one-half hours. The anatomical diagnosis is given as pneumonia alba, chronic splenic tumor, osteochondritis syphilitica, and gummata of the liver, intestine, and stomach. In the last organ there were several discrete plaques occupying the anterior wall. These structures consisted of a granulomatous tissue, in which large, round spindle-cells were found, which originated in the submucosa and extended into the mucous membrane. The second was a fœtus of the sixth month. In it were found pemphigus, gummata in both lungs and in the liver, osteochondritis syphilitica, plaques in the small intestine, and a superficially ulcerated, infiltrated focus, the size of a pea, in the stomach, which had all the characteristics of gumma. The third case was a still-born fœtus. The liver and adrenals contained gummata, and the stomach thickened areas which, upon microscopical examination, presented the appearance of syphilitic granulation tissue developed especially in the submucosa and mucous membrane.

From 1893 to 1896 there appears to be a complete break in the literature of this subject. In this year appeared Stolper's² monograph on visceral syphilis, in which he describes a case of gastric syphilis. This case came to autopsy in the Pathological Institute in Breslau, and was the only instance of syphilitic affection of this organ in 86 cases (25 inherited, 61 acquired) of anatomical syphilis which had been examined post mortem in the institute during three years (1892-1895). It was an example of acquired lues.

The case was a man, aged forty-three years. The anatomical diagnosis was inveterate syphilis; cicatrices on penis; chronic fibroid pneumonia, purulent bronchitis and bronchiectasis; cicatricial stenosis of trachea and larynx; atrophy at base of tongue; chronic and acute lymphadenitis; lobulated liver; ulcerated gummata of stomach.

¹ Zur Kenntniss der gummösen Magensyphilis. Prager med. Woch., 1893, xviii. 581.

² Beiträge zur Syphilis Visceralis (Magen, Lungen, Herzsypills). Bibliotheca Medica, 1896, C. Heft 6.

The stomach was not dilated, and the general mucous membrane was free from thickening. The posterior wall of the organ showed an elevated area of elongated form, consisting of two converging bands which ran in its long axis. These could be covered by two fingers, and in the more elevated places they were the seat of pigmentation and multiple small ulcerations. These "convolutions" gradually became incorporated with the mucosa of normal thickness. The superior one measured 5 cm., the inferior about 10 cm. in length. The peritoneal coat was not thickened over the bands. On section the submucosa appeared greatly thickened, the mucosa in the region of the ulcers was destroyed, and elsewhere was invaded by the submucous infiltration. The microscopical examination showed the pathological process to be located chiefly in the submucosa, and the necrosis and ulceration of the mucous membrane to be the result of the obliteration of bloodvessels passing to it. The new tissue differed from that described by other writers in that it was dense, contained few stainable cells and nuclei, presented in some places a fibrillated myxomatous, and in others a definite necrotic appearance. The diagnosis is regarded as certain, because of the other typical syphilitic lesions in the body, and also because of the peculiar structure of the gastric lesion.

The doubtful example of Wagner¹ was of the acquired form, and was found in a man, aged fifty-eight years, in whom there was also noted syphilitic papilloma of the larynx. The gastric lesions consisted of three elevated and infiltrated foci, the largest being situated on the posterior wall of the stomach a short distance from the pylorus. The lesions were regarded by Wagner as syphilitic, although the microscopical appearances are not given by him. This review contains the authentic cases of syphilitic lesions of the stomach which I have been able to find in the literature. It covers fourteen cases, of which number five were of the inherited, and nine of the acquired form. From it it will be seen that no instance of the disease has been recorded by writers in the English language; indeed, the *Proceedings of the London Pathological Society* do not contain a single reference to such a disease. Further, with one exception, that of Cornil and Ranvier, the entire literature is German.

The case which I have to report is that of a male, aged fifty-two years, whose illness extended over a period of three years. The man was a patient of Dr. Irving Miller, of Baltimore, to whom I am indebted for the main clinical history and for the privilege to do the autopsy. He was in the hospital on two occasions, but only remained to be examined; he was not treated there. Dr. Miller writes: "I first saw the patient in August, 1892. At that time he was a large, fairly well-nourished man, about six feet in height, and weighing 170 pounds.

¹ Das Syphilom, Arch. d. Heilkunde, 1863, iv. 225.

His average weight was 200 pounds. His occupation was that of a showman. The first appearance of his illness was the preceding Christmas, while filling an engagement in Boston, and followed a drinking-bout and exposure. It was ushered in by a severe spell of vomiting, which persisted for several days, and was followed by irregular chills. This condition of affairs continued off and on until the summer, when I first saw him. At this time the temperature ranged around 101° F.; there was a tumor in the splenic region extending 9 cm. below the costal margin and forward nearly to the umbilicus. Exquisite tenderness was present all over the area of dullness. I regarded the tumor as being the enlarged spleen. The urine contained bile-pigment, and there was some pigmentation of the skin. Neither sugar nor albumin was found in the urine. There was little change in the conditions noted for several months, when the splenic tumor was found to have diminished markedly and ascites to have appeared. The dropsy increased, involving the legs and scrotum. The patient was tapped for the first time on April 20, 1893; three and one-half gallons of fluid were withdrawn. The tapping was repeated at intervals of six days to two weeks, the amount of fluid withdrawn varying from two to six gallons. The relief afforded by the paracentesis was so great that the operation was resorted to to enable the patient to go fishing the next day. The accumulation of fluid continued for two years, and then began to diminish until very little fluid could be detected in the abdomen. Purges were occasionally administered. The morphine habit was acquired. The night before his death the patient dined abundantly on fried crabs and ice-cream. When I saw him, a few hours before his death, there were intense abdominal pain and tympanites. Pulse thready, weak, 130 to the minute; profuse sweating. He died in the early morning." The patient had been in the hospital on two occasions, in February, 1893, and March, 1894, for examination. On his first entrance Dr. Hewetson found a full abdomen; no increase of liver dullness; the spleen enlarged and palpable three to four finger-breadths below the costal margin. When he returned in 1894 he reported having been tapped at intervals of about ten days, in all sixty-five times. After the removal of 9700 c.cm. of fluid the liver could be felt below the eusiform cartilage; it was hard and apparently bound down by adhesions. A probable diagnosis of hepatic cirrhosis was made.

The autopsy was performed eight hours after death on a warm day in June. The anatomical diagnosis was: Old adhesions between liver, stomach, spleen, and pancreas. Large hepatic gumma. Syphilitic ulcer of the stomach with perforation. Acute diffuse, sero-fibrinous, and gaseous peritonitis.

Only such parts of the protocol as bear on the subject of the paper are given. The peritonitis, it may be remarked, was caused by a mixture of the bacillus aerogenes capsulatus and the bacillus coli communis, the former organism predominating.

The omentum was greatly shortened, the small intestine contracted, and the general serous surfaces were thickened. The loops of the jejunum and ileum were particularly firm and rigid. The spleen was much enlarged, measuring 12 x 7 x 7 cm.; capsule opaque and cartilaginous. No gummata. It was bound firmly to the fundus of stomach and covered by the very closely adherent omentum. The latter

structure contained little fat, appeared as a mass of tatters, and was gathered together at the left border of the stomach, with which organ and the spleen it was firmly united. In gently separating the adhesions in this region stomach-contents were seen to issue from a small opening in this organ. They agreed with the material found in the peritoneal cavity when it was first opened. The wall of the stomach in this situation was firm and board-like, and, on being dissected away from the spleen, was found thickened out of all proportion to the rest of the organ. The perforation had taken place below the splenic adhesion and at a point uncovered by complete omentum.



Stomach laid open along the lesser curvature. Natural size. Drawing was kindly made by Dr. Livingood.

On opening the much-contracted stomach the general mucous membrane presented a mammillated appearance, but in the fundus 4 cm. from the œsophageal opening and occupying the greater curvature a large ulcer, measuring 5 x 5 cm., was found. The base of this over

most of the central part was the muscularis; the edges were thick, polypoid and firm, and the perforation 15 x 3 mm. in size. Just about the perforation the tissues presented a greenish and necrotic appearance.

The liver was bound to the diaphragm; its capsule was thick and cartilaginous. The left lobe was reduced to a mere appendage; but it was firm and nodular. The right lobe was not especially reduced in size. On section of the organ the remnant of the left lobe was occupied by a mass formed by the confluence of several gummatous nodules, and the mass extended well into the right lobe along its lower border. The tumor thus formed lay over the portal vein, which was thick and white in color as it entered the porta of the liver and passed upward to the summit of the liver between the lobes and impinged on the vena cava.

The dimensions of the tumor were 11 x 4 x 5 cm. The gummata were of perfectly characteristic appearance and, on histological examination, presented the usual structure. Gummata were not found in other organs.

For the purpose of the microscopical study, pieces of the ulcer from several different parts were subjected to examination. The principal microscopic characters are as follows: The pathological process is localized chiefly in the submucosa and exists in two distinct stages. The earlier stage is less frequently met with, and consists of a cellular infiltration of the submucosa through which this tunic is rendered much thicker than normal. The cells belong, in general, to the type of granulation-tissue cells, many of which are large and epithelioid in appearance. They are interpolated between the old connective-tissue fibrils and collected into large, more independent foci. The infiltration extends from the submucosa into the muscular coat, and to a much less degree into the mucous layer. The muscularis mucosa is for the most part the limiting line above. Within the large cellular accumulations foci of necrosis occur. These are quite large, and consist of centres of coagulation necrosis in which much fragmentation of nuclei and emigrated polymorphonuclear leucocytes are prominent features. The form of necrosis is consistent either with tuberculosis or syphilis; in its acuteness it resembles that seen in the former disease. The necrotic foci extended freely into the muscle and not at all into the mucosa. The bloodvessels in this situation show a simple infiltration of the adventitial coat except in the necrotic areas, where they are obliterated.

The later stage is more common, and is what is met with in all parts of the ulcer and the tissues forming its elevated boundaries. It consists of dense fibrous tissue which, again, is developed chiefly in the submucous and then extends into the muscular tunic. Scattered granulation-tissue cells are found among the developed fibrils. The bloodvessels are extensively diseased; endarteritis and endophlebitis obliterans and hyaline thrombosis, with organization, are common. The serous coat, too, is thickened and in some places about the adhesions greatly so.

The base of the ulcer is covered to some extent with mucous membrane, and only in its centre is it bare. The muscular coat is exposed in this part, and the more superficial fibres are quite necrotic. The elevated edges of the ulcer are clearly not the remains simply of the

old mucosa and submucosa. This is proven by comparison with the surrounding intact mucosa, which is much less elevated. The microscopical examination shows the thickening to be due to a new development of dense fibrous tissue, such as was described in the later stages of the general pathological process.

There can, I think, be no doubt that the ulcer is of syphilitic origin ; the character of the new tissue and the form of cell-death met with seem sufficient proof for this belief. But I think it much more improbable that it is due to the softening of a gumma. Indeed, I find very little evidence in support of such a view. On the other hand, the appearance described speaks more for an indirect form of necrosis of the mucous membrane, brought about by the combined softening of the submucous gummatous infiltration and the obstruction and obliteration of bloodvessels in the same situation. The mucous membrane thus deprived of its nutrition became necrotic, was removed, and the ulcer resulted. The submucosa suffered either directly through necrosis of the infiltrating cells, or, again, indirectly, owing to the vascular changes combined with the action of bacteria.

The clinical course of the disease is made clear by the autopsy findings. The splenic tumor and ascites were the result of the portal obstruction ; the obstructing agent was the syphilitic tumor. It seems reasonable to suppose that the gumma was larger at one time than it was at the autopsy, and that the reduction of the ascites was owing to this change. The evidence for this might be found in the size of the left lobe of the liver, and is strengthened by the absence of a marked collateral circulation. The immediate cause of death was the perforation into the peritoneal cavity of the gastric ulcer in a part unprotected by adhesion with surrounding structures.

THE DIAGNOSIS OF NEPHRITIS WITHOUT ALBUMINURIA.

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THE diagnosis of non-albuminuric nephritis is so inseparably connected, logically and symptomatically, with nephritis attended by albuminuria that certain exceptional features of the latter type must be first considered. Acute and chronic nephritis are usually diagnosticated with ease when the urine of every patient is examined systematically, repeatedly, and from twenty-four-hour specimens, considering specific

gravity, gross amount of solid excretion, albumin, and microscopic morphology—casts, blood, pus, etc. It is justly believed that care in the directions indicated insures accurate diagnoses, a supposition in the main correct, and yet subject to various clinical errors. Considering, then, under diagnosis exceptional clinical features, the amount of urine may decrease in the terminal stage of interstitial nephritis, or be constantly small when cardiac hypertrophy fails to develop, for example, in parenchymatous types, or when, in interstitial forms, general nutrition is sufficiently impaired to preclude the usual myocardial hyperplasia and hypertrophy. Low specific gravity and decrease in total solids may indicate persistent functional inadequacy rather than organic renal disease. Albumin is found in most cases in which repeated examination is made of the daily quantity passed. It goes without saying that analysis of single specimens is particularly deplorable from the obvious and often vainly emphasized errors incident to such superficial examination. Clinical experience teaches that we often rely with a sense of false security upon signs and symptoms generally regarded as classical or infallible. Hence we are subsequently astonished at the pathological lesions revealed at autopsy. This statement applies particularly to albuminuria in nephritis. I am certain we overlook both acute and chronic nephritis in regarding albuminuria as a certain or constant symptom. Nephritis without albuminuria certainly exists, although reference to the subject is very meagre in established and current literature.

Casts may be found at intervals when albumin is temporarily absent, when albumin is permanently absent or late in resolving inflammatory processes after chemic tests prove the final absence of albumin. Casts should be searched for, even when albumin is absent, although many are prone to examine the sediment of non-albuminous urine with predetermined negative results.

Our conceptions have been broadened concerning the significance of hyaline casts, now regarded as occurring in urine otherwise apparently normal. Granular and epithelial casts probably always point to degenerative or inflammatory lesions.

As a cardinal diagnostic point with retinitis, albuminuria, and the urinary findings, we consider those cardio-vascular alterations which, frequent in the interstitial, are at least inconstant in the parenchymatous types. Heart and arterial changes are by no means invariable, even in contracted kidney. Cardiac hypertrophy may be simple, as in primary contracted kidney, or eccentric, as in other forms of contracted kidney. There may be dilatation without hypertrophy, or, indeed, even myocardial atrophy is found, as observed in a recent case. The circulatory changes may be otherwise explained — *e. g.*, from arterio-sclerosis of different etiology. Senator states that he who invariably examines the

urine and heart in every instance rarely fails to diagnosticate nephritis. This very interdependence of cardiac and renal physiology and pathology, usually of diagnostic aid, may prove a source of clinical confusion. Thus primary cardiac disease may cause renal congestion, embolism, or even acute or chronic nephritis. Again, alcohol or syphilis may be a common cause for an arterio-sclerosis, myocarditis, and nephritis, diseases as subordinate to the causal factor as possibly independent of each other. Finally, a heart lesion may be wholly secondary to renal disease. While simple renal stasis is usually differentiated with ease by considering the sediment, the absence of inflammatory insignnia, and the parallelism between urinary findings and cardiac activity (whence the diagnostic value of such cardiants as digitalis and strychnine), yet in terminal stadia with cardiac weakness, extensive hydrops, dyspnœa, râles, or systolic murmur, it may be difficult or impossible to differentiate between myocarditis with renal stasis and renal disease with ultimate cardiac asystole, although gallop-rhythm is more common in the heart of renal disease than in primary cardiac affections.

The diagnosis of latent, atypical, non-albuminuric nephritis, important in itself, becomes more difficult and important when nephritis is associated with other diseases. In the logical process incident to the diagnosis of frank nephritis, we often ask ourselves, Is the nephritis the sole lesion? Many errors are made in the interpretation of this question, although the observative element in our process may be absolutely correct. Finding a patient with undoubted nephritis we ask, Where does said nephritis stand? What is its exact dignity? Is its cause hidden? Is it primary? Is it somewhat of an accidental finding? At this point the most delicate analysis is demanded if we would diagnose correctly. It is frequently most difficult, or actually impossible, without several early, careful observations of a case, to decide upon the first examination whether a chronic nephritis is the cause of a pericarditis, pleuritis, or pneumonia, since nephritis in lessening physiological resistance is frequently complicated by these highly characteristic, secondary, or it may be, terminal infections. Conversely, a tubercular pleurisy, a pulmonary tuberculosis, or a genuine lobar pneumonia is capable of exciting secondary nephritis. In the two possibilities cited it is not always easy to separate an acute from a chronic nephritis, whence the diagnosis with the parallel prognosis may depend solely upon the chronological test, the clinical evolution of the disease. Many can recall from hospital practice instances of skull fracture, miliary tuberculosis, leptomenigitis, cerebral abscess, sepsis, and other diseases, falsely diagnosticated uræmia, simply because nephritis was also present. Senator¹ has said, doubtless from personal diagnostic errors, that with-

¹ Senator. *Erkrank. der Nieren*. Nothnagel's System, Bd. xix. Theil v. Abth. 11, S. 174.

out previous history we can often only diagnosticate a renal disease and suspect other latent affections. The danger of mistaking uræmic symptoms, as hemicrania, nervous symptoms, dysentery, etc., for independent disease must be greater in direct ratio to difficulty of diagnosis. The object of the paper is to emphasize certain anomalous types of both acute and chronic nephritis and personal diagnostic errors in their study. Many authors, as Tyson,¹ have remarked upon the lack of correspondence between the clinical and pathological findings in nephritis. Semmola² holds that clinicians err in considering albumin in the urine the measure of nephritis. Cantharidin produces an intense nephritis, attended, however, by very slight albuminuria, while mercurials produce slight parenchymatous changes with copious albuminuria.

Few authors record acute nephritis sine albuminuria. Lecorché and Talamon have never observed the combination. Quriolo³ described a case of post-scarlatinal nephritis unattended by albuminuria. In speaking of the general difficulty of diagnosing nephritis when no albumin is found, he remarks that not only œdema, but also uræmia and death occur with wholly negative urinary findings. In his case nephritis was determined at autopsy. *Intra vitam*, the urine was free from albumin; the amount, the specific gravity, and percentage of urea were satisfactory. Dickinson⁴ mentions that casts may be absent in what he designates acute interstitial nephritis, though much albumin be present. Bartels⁵ never observed nephritis without albuminuria in acute parenchymatous nephritis, although in cases of acute scarlatinal nephritis without autopsy he suspected the condition, but could not demonstrate it. Henoch⁶ saw marked acute non-albuminuric parenchymatous nephritis with casts toward the end of life, and in a second case albumin, present at first, later wholly disappeared. Fermi observed a scarlatina epidemic in which nephritis prevailed without albuminuria. We must remember that anasarca complicating scarlatina does not necessarily prove the existence of nephritis. Bartels found casts constantly in acute nephritis. He cautions against interpreting as nephritis the albuminuria occurring in severe infectious disease, even though accompanied by hyaline casts. Blood or blood-casts should also be present to confirm the diagnosis. Rosenstein⁷ possibly hints at the danger in overlooking acute nephritis when he remarks that disappearance of albumin in acute nephritis is no proof

¹ Tyson. *Practice of Medicine*, 1897.

² Semmola. *Nuove contribuzioni sperimentali alla patogenia disercasica o ematogena dell'albuminurica brightica*. *Riforma medica*, 1894, No. 254.

³ Quriolo. *Riforma med.*, 1896, No. 99.

⁴ Dickinson. *Allbutt's System*, vol. v. p. 369.

⁵ Bartels. *Ziemssen's Pathologie und Therapie*, Bd. ix. p. 247.

⁶ Henoch. *Berliner klin. Wochensch.*, 1893, No. 50.

⁷ Rosenstein. *Nierenkrankheiten*, pp. 128 and 144.

that the process has ended, since blood and casts may persist and indicate that the inflammation still lives. Rosenstein has seen blood and casts appear in scarlatinal nephritis before albumin could be detected. Senator¹ regards albumin as constantly present in acute parenchymatous nephritis. Leube² has never observed its absence in acute nephritis, although he speaks of alleged instances in literature. Sanné found albumin absent thirty times in one hundred and twenty-four cases of scarlatinal dropsy.

The following case was observed in my service in Cook County Hospital, July 26, 1895, to August 30, 1895:

P. F., No. 143,474. Swede, aged twenty-six years, single. Family history quite negative, one brother having died at twenty-three years with pulmonary tuberculosis. Personal history: Lived in Chicago seven years; drinks beer occasionally; uses no whiskey; smokes. Previous disease includes only poorly-remembered diseases of childhood. Present affliction began three weeks before admission, with anorexia, slight diarrhoea, weakness, fever. No headaches, vomiting, epistaxis.

Examination: Apathetic. Dichrotic pulse. Rose spots. Splenic tumor. Slight diarrhoea, with characteristic typhoid stools. Slight cough. Pulse 70 to 88 or 90. Temperature 102°-104° F., with solution by lysis. Respirations 24. Urine 1175 c.c., acid, amber, specific gravity 1022; no albumin, no sugar, no casts. The diagnosis was typhoid, and the treatment was fluid diet, sponging, salol and calomel. Four days after admission the eyelids became oedematous. The urine showed no albumin. The anasarca becoming very pronounced and notable on chest, ankles, and face, the urine was again examined from a twenty-four hour specimen, with the following result: 1100 c.c.; acid; no reaction to nitric acid, picric acid, or ferrocyanide tests for albumin; specific gravity 1016; microscopically, a small number of red disks, many granular and epithelial casts. The diagnosis of intercurrent acute nephritis in the course of typhoid was inevitable, despite the lack of albumin. Tests were carefully made with the same results again on August 1st, and every other day until his discharge on August 30, 1895, the amount of urine remaining practically the same, specific gravity varying from 1014 to 1016 or 1018. Granular, epithelial, and once several fatty epithelial casts were found. At the time of discharge the casts, so numerous at first, had all but disappeared, an occasional granular cast being found only after examination of several slides. Fortunately, anatomical confirmation of the diagnosis was lacking.

A second case, an acute exacerbation of a chronic nephritis, was seen with Dr. B. Van Hoosen. Previous history was chiefly of repeated attacks of erysipelas covering a period of at least six years. The patient was extremely nervous, and had suffered from weak stomach and capricious appetite. The patient, when first seen, was suffering from recurrent erysipelas, which, nearly healing in one locality, broke out again anew in contiguous areas and covered repeatedly the face,

¹ Nierenkrankheiten in Nothnagel's System specielle Pathologie u. Therapie.

² Leube. Diagnostik der inneren Krankheiten.

trunk, and extremities. Nausea was a prominent symptom. There were no suggestive cardio-vascular findings. The temperature was but little above normal, the pulse tended to rise with exertion. An emphysema, with the usual findings, existed. Nephritis was suspected, but two examinations showed no albumin, no casts, no decrease in total solids, specific gravity, nor quantity. A third specimen gave the least clouding with picric acid; the fourth gave no albumin, but a few hyaline casts, with some blood cells, were detected in the centrifuged sediment. The albumin and casts disappeared, but the general condition became much worse, and in about two weeks after first examination cardiac dilatation with a tachycardia of 130-160 intervened. Cardiac stimulation of enormous amounts of digitalis, morphine, nourishing enemata, infusions of salt solution, whiskey, strychnine, ammonia were unavailing. Just before death considerable blood appeared in the urine. The probable ante-mortem diagnosis was nephritis (acute upon chronic), cardiac dilatation, and recurrent erysipelas. The autopsy, at which Drs. F. X. Walls, B. Van Hoosen, and R. Hickey-Carr were present, revealed very slight arterio-sclerosis, marked pulmonary emphysema, bronchial catarrh and stasis, hepatic congestion, fatty degeneration and focal microscopic induration and round-cell infiltration, induration of spleen and dilated heart. The kidneys were deeply congested, and, while not weighed, measured about 2-4 cm. more than normal in every direction. The capsule was not universally adherent, but tore the renal parenchyma here and there over a considerable area in both kidneys. The cortical markings were obscured, and here, as in the medulla, deep-red streaks alternated with yellow to gray bands. Dr. Walls, Director of the Pathological Laboratory in Northwestern University Medical School, kindly examined microscopically all of the viscera, and found the following changes in the kidneys:

The sections are very diffusely congested. The capsule is thickened and infiltrated with small round cells. Immediately beneath the capsule in the cortex of the kidney are many areas of dense round-cell infiltration which are distinctly perivascular, varying in size from small foci to large wedge-shaped areas about one-fiftieth inch in diameter, with apices directed outward. In the larger areas compressed, degenerated foci are observed, together with atrophied tubules and occasional fibrous glomeruli. The cortex is the seat of advanced parenchymatous change. Little change is observed in the connective tissue, only occasional spots of perivascular round-cell infiltration being seen. Most of the glomeruli are large, with congested tufts and slightly increased connective tissue. Some of the cells of Bowman's capsule are swollen and desquamated. The convoluted tubules are distended, the lumen large, filled with light amorphous, granular material. The epithelial cells are large, coarsely granular, with faint or absent nuclei, often desquamated. Here and there the tubules are filled with red blood-cells. The tubules are relatively intact in the medullary part, although filled now and then with red disks and casts. The large bloodvessels show slight intimal induration and increased fibrous tissue in the muscular coat.

Whether we interpret the pathological findings as those of acute parenchymatous nephritis or as an acute exacerbation of a chronic nephritis, they are equally to the point. In either instance hyaline

casts found once, and a mere trace of albumin, correspond clinically equally well, or indeed better, with parenchymatous degeneration than with acute nephritis of the intensity observed microscopically in the case quoted. I expected to find a chronic interstitial change rather than parenchymatous inflammation.

Rayer¹ was probably the first to remark the disappearance of albuminuria in the course of chronic Bright's disease. Many authors have since noted examples of profound renal lesions without albuminuria during life. Albumin may be absent even in amyloid nephritis. Mahomed states that absence of albumin is almost the rule in the contracted red kidney. Lecorché and Talamon² believe that albumin is rarely absent constantly, that one urinary examination is sufficient, and that tests of several specimens must be made with delicate and various reagents. They quote an instance of saturnine nephritis in which albumin disappeared when the glomeruli became fibrous and their secreting function was suppressed. Burrows described similar cases. Roberts³ relates a case of post-scarlatinal parenchymatous nephritis in which the urine for four months prior to death contained no albumin, blood, or casts. Autopsy revealed a large white kidney. Roberts remarked that the anatomical findings could not be questioned. Lecorché believes that latent nephritis is but nephritis observed in periods of remission or complete compensation. Lecorché and Talamon, after stating the well-known fact that the percentage of albumin is not proportionate to the severity of the renal lesion, describe death occurring from cerebral hemorrhage, cardiac arrest, or intercurrent disease while the urine is quite negative. Necropsy shows contracted kidneys, and the absence of albumin is explained by the fact that the diseased glomeruli become fibrous and impermeable; hence only the sound glomeruli secrete urine, which is therefore free of albumin. Lancereaux⁴ observed fatal saturnine nephritis unattended by albuminuria. Ackermann described a case of chronic parenchymatous nephritis in which, during the last thirteen weeks of life, renal casts were absent. The necropsy explained their absence, since in the pelvis of the kidney there was a mass of casts weighing eight grammes. Eichhorst noticed the absence of albumin from the urine for weeks and months at a time, so that the patient may even be considered well until a fresh setback occurs. Leube cannot confirm statements that albuminuria can be entirely wanting in chronic (interstitial) nephritis, while Rosenstein states that albuminuria, though important, is not indispensable, and that we should always examine for casts, since they may occur without albuminuria. Senator maintains that albumin is constant in chronic diffuse non-indura-

¹ Lecorché and Talamon, p. 610. *Traité de l'Albuminurie et du Mal. de Bright.*

² *Ibid.*

³ Roberts on Urinary Diseases, p. 355.

⁴ Lancereaux. *Trans. Internat. Med. Congress*, 1881, vol. xi. p. 191.

tive nephritis, and that cases of alleged interstitial nephritis with wholly non-albuminous urine are but instances of arterio-sclerotic induration. Dieulafoy's experience includes four cases in which the uræmia of interstitial nephritis was unattended for seven months to a year by any albuminuria. Delafield,¹ under the title of "Chronic Productive Nephritis without Exudation," writes that the urine is without albumin or casts or with albumin and very few casts. Bartels states that the chemic analysis shows constant albuminuria in chronic parenchymatous nephritis, which never fails during the entire clinical course. The same author holds that it is not constant in interstitial types, and observed a single instance in which albuminuria was constantly absent. Tüngel has often found it absent in chronic interstitial nephritis. Regarding absence of casts, Sehrwald² noted disappearance of casts without that of albumin. He described in urine containing but few casts many granular masses and free nuclei, while the cylinders became paler and more delicate. Casts, he maintains, may be dissolved in urine, not from chemic causes nor from decomposition alone, but from the presence of pepsin in acid urine, the action of the pepsin being increased by the urine remaining long in the bladder or by high temperature. The dissolution of casts may occur even in the kidney itself. He recommends examination of freshly-catheterized specimens, not long excreted into the bladder before withdrawal.

CASE III. *Acute diffuse parenchymatous nephritis*.—W. A. W., St. Luke's Hospital, October 25 to November 4, 1896. History written by Dr. Thomas H. Lewis. A book-keeper, English nativity, aged thirty-five years, married. Complains of pain in back, chest, and legs. On September 26, 1896, present illness began with dull pain extending from throat to epigastrium, and with pain in the lumbar region. Marked dyspnœa and palpitation existed. There was pain over the lower lobe of the left lung. Great thirst, anorexia, constipation. After treatment outside of hospital, pain disappeared and dyspnœa ceased; but two weeks later, after sleeping near an open window, his joints became swollen, the left knee being especially painful.

Previous illness: Usual diseases of childhood. At seven, rheumatism. In 1890 stomach trouble from which patient lost seventy-five pounds. The thyroid gland became swollen, his pulse rapid, and marked exophthalmos developed. No history of venereal disease.

Family history. Maternal grandfather died of gout. Otherwise negative.

Personal history. At present uses tobacco and liquor moderately, although formerly drank whiskey in large amounts.

Physical examination. General nutrition fair. Mucous membranes normal. Considerable exophthalmos, with von Graefe's sign. Tongue slightly coated. Lungs negative. Dilatation of left ventricle, apex being finger's-breadth beyond the nipple-line. A short, superficial,

¹ Delafield. Twentieth Century Practice, vol. 1.

² Sehrwald. Deut. med. Wochens., 1890, No. 24.

rather rough systolic murmur was heard during complete expiration during the last two days of life. The pulse was uniformly rapid, from 110 to 120. Respirations 38 to 44. Temperature-curve ranging from 101.6° to 103.8° F., fairly though not absolutely continuous. The thyroid was not enlarged. Abdomen negative, no tympany, rather sunken in contrast with the well-formed thorax. No splenic tumor; liver, normal outlines. The knee-joints were swollen, painful, with distinct floating of the patella. Pain without swelling in right shoulder and left wrist. No œdema. The patient complained of precordial pain. Alkalies and salicylates, and, finally, potassium iodide in full doses relieved neither the pain nor the swelling. The bowels moved freely after administration of calomel; stools were dark in color. Considerable pharyngeal pain and hyperæmia on the ninth day; appropriately treated. At the same time the pulse rose to 150, and dyspnœa, with cyanosis, was marked; combated with strychnine, digitalis, camphor, and whiskey. Death from cardiac exhaustion on the eleventh day after entrance. Urinalysis, acid, 1018 to 1028, darkish color, no albumin, no sugar, urea 2 per cent., amount thirty to forty ounces, although bowels were constantly relaxed; microscopic examination showed stray pus-cells.

The diagnosis was uncertain for a long time. The patient had exophthalmic goitre, which might have explained many of the findings, yet certainly not the temperature, angina, and articular signs. Typhoid fever was excluded by the absence of roseolæ, splenic tumor, tympany, character of the stools, absence of delirium, etc. A rapid pulse in a goitrous subject would not exclude complicating typhoid. Miliary tuberculosis was considered, favored by the cyanosis, dyspnœa, and increased respirations, perhaps, but still the circulatory failure, articular swellings, angina, argued against it. Sepsis cryptogenetica best explained the course and findings, the angina, synovitis, etc. Ulcerative endocarditis was considered, but rejected. The urine was searched chemically and microscopically with great care for possible evidence corroborative of sepsis in the form of nephritis, but repeated examinations were negative.

Autopsy, November 6, 1896. Pleuræ practically negative, except many ecchymoses. Pericardium-cavity obliterated almost completely by old adhesions and by fresh exudate at apex, mostly fibrinous, but partly sero-sanguineous. Stripping off the fresh exudate, the visceral and parietal leaves of the pericardium showed hemorrhagic areas. The valves were practically normal. The ventricles were dilated and hypertrophied, the right being 6 mm. and the left 15 mm. thick. The lungs showed a few hemorrhagic infarcts, pulmonary œdema, hypostatic congestion, and a few cases of lobular pneumonia. Hemorrhages were found in the renal pelvic mucosa, in the pancreas, and in the articular synovial membranes. The liver was slightly enlarged, fattily degenerated, and somewhat congested. The kidneys were very large; unfortunately, they could not be weighed; the capsule stripped readily, showing subcapsular ecchymoses. The cortex was swollen and its markings were very indistinct. The organs were the seat of cloudy swelling, and were, like other parts, considerably congested. Several white infarcts existed. As the macroscopic renal findings were a surprise, special attention was given to the microscopic examination. In the cortex were areas in which exudation of white cells was sufficient

to obscure the field; less exudation existed in the medulla. The glomeruli were not greatly altered, there being some congestion, some exudation, and considerable deformity by thickening of the capsule. The epithelial cells lining the large and small tubules were universally degenerated, disintegrated, and desquamated, the cells without nuclei contrasting sharply with the deeply-stained extravasated leucocytes. No essential nor systematic increase in connective tissue, except in quite a number of the glomeruli. Undue vascularity existed, together with pouring out of the hæmocytes into the desquamated uriniferous tubules.

Diagnosis. An acute diffuse parenchymatous nephritis, with possibly more ancient changes of distinctly minor dignity.

Stewart¹ justly remarks that when albumin is not found, the later search for casts is at the best perfunctory. Said search must be conducted carefully with the aid of a centrifuge, with a low lens and properly graduated illumination. He believes that albumin may be constantly absent throughout the course of chronic nephritis, and casts be detected only after much search. He frankly states the conviction, which we also feel regarding our own experience, that he has overlooked many cases of nephritis without albuminuria. Wilkes² has pointed out that granular or cirrhotic kidney may not be evidenced by albuminuria, Stewart admitting that the form described is not a true nephritis. As Stewart states, Osler, Fagge, Jaksch, and others mention the subject briefly, if at all. Millard³ and Mahomed⁴ speak of the absence of albuminuria, but refer chiefly to granular kidney or the typical arterio-capillary fibroid kidney of Gull. In the cases reported by Mahomed, the kidneys belonged to the second stage of his classification, the first being functional renal inadequacy, without renal or circulatory alteration, the second chronic Bright's disease without nephritis (red granular kidney, arterio-capillary fibroid kidney), and the third chronic Bright's disease with nephritis (mixed or mottled granular kidney), where epithelial changes exist and diagnosis is easy. Stewart's estimation of Mahomed's view as extreme is just. It seems that Mahomed has, in instances at least, confused cause and effect, and that arterio-sclerosis is forced to explain too much.

Case I. of Stewart was nephritis without albuminuria, but with hyaline and granular casts found once. Of his seven cases one came to autopsy, which revealed granular kidneys and hypertrophied heart, although the casts and albumin seemed to have been absent throughout its course. Stewart holds that several of his cases do not correspond

¹ Stewart, D. D. Occurrence of a Form of Chronic Bright's Disease, other than Typical Fibroid Kidney, without Albuminuria. Transactions Pan-American Med. Congress, 1893, p. 191. See ref. 23-24.

² Wilkes. Guy's Hospital Reports, second series, vol. ii.

³ Millard. Chronic Bright's Disease.

⁴ Mahomed. Guy's Hospital Reports, 1879, vol. xxiv.; and Chronic Bright's Disease without Albuminuria. Ibid., 1880-81, vol. xxv.

to the fibroid kidney, the one form in which albumin may be persistently free. Epithelial changes were present, proven from the finding of hyaline, granular, and waxy casts.

He tabulates the differences between what we may term his type of nephritis and the parenchymatous and interstitial forms as follows:

<i>Chronic Parenchymatous Nephritis.</i>	<i>Chronic Interstitial Nephritis.</i>	<i>Form of Chronic Non-albuminuric Nephritis closely resembling neither.</i>
Urine always albuminous; scanty in amount except during secondary atrophy, then may be abundant; light colored, depositing urates readily. Specific gravity normal or lighter than normal, though low for amount passed.	Urine not constantly albuminous; usually to degree recognizable by Heller's test. Urine profuse unless cardiac failure with dropsy, etc., light colored, low gravity; slight sediment, often invisible.	If urine is ever albuminous, it is probably not as an incident of the malady, as the most decided symptoms of renal inadequacy may be present, or indeed uræmia with persistent absence of albumin; urine subnormal in amount, quite scanty, high colored, without cardiac weakness and dropsy, with high blood-pressure; gravity lower or higher than normal, though relatively low considering amount.
Casts numerous, great variety, epithelial, granular, hyaline, waxy; blood-corpuscles, and connective tissue; shreds not infrequent. Microscopically urates and phosphates predominate; oxalates less common.	Casts not frequent, usually hyaline, less often granular. Renal epithelium and blood-cells scanty or absent; oxalates common.	Casts common, but not numerous, principally hyaline but granular, present in all though in less number; epithelial casts rare (seen in very small number in two cases); waxy casts in one case; cylindroids in all, in several very numerous; renal epithelium in all; oxalates very common; urates often in relative excess; occasionally blood and pus cells.
Urea usually much diminished, uric acid practically normal.	Total solids often normal; urea may be normal, usually diminished; uric acid is usually diminished.	Total solids, urea and mineral salts, always diminished in amount; uric acid normal or diminished.
Cardiac hypertrophy not invariable, though tendency to increased blood-pressure. Atheroma not common in early stages.	Hypertrophy usual; blood-pressure raised; fibrosis almost invariable and pronounced.	Hypertrophy not detected, although in all first sound forcible, second aortic accentuated; blood-pressure raised in five (out of seven); not detectable in two while on non-nitrogenous diet; no arterio-sclerosis in any.
Uræmic symptoms common, although less than in interstitial; no loin pain.	Uræmia common; no loin pain.	Uræmic signs common; loin pain usual.
Dropsy usual; obstinate.	No dropsy, and even œdema not often detectable till disease advanced.	No dropsy; œdema not common.
Occurs mostly after age of forty. Patient pale and waxy looking.	Mostly after forty (degenerative period); for a long time only failure of nutrition noted; grayish complexion.	Three cases under thirty, others middle aged; no degenerative process; facies pale; no marked anæmia.

Stewart comments upon the dissociation of casts and albumin in his series of cases, casts being more or less constantly present, while albu-

min was usually absent. Probably casts are due "rather to faulty metabolism or inflammatory irritation of the renal epithelium than to exudation of serum."¹

Charles W. Purdy,² of Chicago, wrote an exhaustive article upon the "Pre-albuminuric Stage of Chronic Nephritis," in which, however, his stress was laid particularly, as his title hints, upon the absence of albuminuria in the formative stages of the disease, quoting Burrows, Christison, Rayer, Reed, Malmsten, Grainger Stewart, and Roberts.

Graves and Monneret have noted nephritis without albuminuria, as have also Hue, Huchard, Millard, Guesdon, Dolespierre, Gand Delalande, Dieulafoy, de Coquet, and others already cited.³

We are forced to ask ourselves whether casts always indicate nephritis—*i. e.*, whether finding casts without albumin is adequate proof of nephritis. Zimmermann, Key,⁴ Griesinger, Meyer,⁵ Rosenstein,⁶ Vogel, Thomas,⁷ Senator,⁸ Burkart,⁹ Fischl,¹⁰ Bartels,¹¹ Nothnagel,¹² etc., have exceptionally observed cylindruria without albuminuria. When Steinbeck constructed the centrifuge, Leyden and Glaser found hyaline casts in the urine of healthy individuals. Radomyski¹³ examined cases of valvular heart disease, arterio-sclerosis, gastro-intestinal inflammation, pulmonary tuberculosis, acute infectious diseases, carcinoma, cachexia, nervous diseases, and healthy individuals, and found casts in a very great number, explained by him as the result of circulatory disturbance. Daiber¹⁴ found hyaline and granular casts without albumin, especially in circulatory and amyloid disease. Alber¹⁵ reported granular, hyaline, and epithelial casts and red blood-disks without albuminuria. Kossler¹⁶ reports hyaline, granular, epithelial, waxy, and corpuscular casts in many infectious and other conditions without coincident nephritis or albuminuria. The specimens microscopically showed only degenerative changes, but no inflammatory insignia. In his observations nucleo-

¹ Lubarsch. *Centralbl. f. allgem. Path.*, Bd. iv. No. 6; Aufrecht, *Centralbl. f. clin. Med.*, June 30, 1893.

² Purdy. *Pre-albuminuria Stage of Chronic Bright's Disease*. Chicago Medical Journal and Examiner, May, 1885.

³ Saundby. *Occurrence of Dropsy in Granular Kidney*. Hue. *Thèse*, Paris, 1859. Huchard. *Union Médicale*, 1874. Millard. *New York Med. Journ.*, 1882. Guesdon. *Thèse*, Paris, 1882. Delespierre. *Thèse*, Paris, 1884. Gand Delalande. *Thèse*, Paris, 1884. Dieulafoy. *Soc. Méd. des Hôp.*, 1886. de Coquet. *Thèse de Bordeaux*, 1890.

⁴ Key. *Om. S. K. Tubularafjuringar*, Stockholm, 1863.

⁵ Meyer. *Virchow's Archiv*, Bd. v. S. 199.

⁶ Rosenstein. *Nierenkrankheiten*, pp. 128 and 144.

⁷ Thomas. *Archiv f. Heilkunde*, Bd. xiv.

⁸ Senator. *Virchow's Archiv*, Bd. lx.

⁹ Burkart. *Die Harncylinder*, Berlin, 1874.

¹⁰ Fischl. *Prager Vierteljahresschrift*, 1878.

¹¹ Bartels. *Ziemssen's Pathologie und Therapie*, Band ix. p. 247.

¹² Nothnagel. *Deut. Archiv f. klin. Med.*, 1891, No. 43.

¹³ Radomski. *Gesammte Abhandlungen aus der medicin. klinik zu Dorpat*. Wiesbaden, 1893.

¹⁴ Daiber. *Correspondenzblatt f. Schweizer Aerzte*, 1894, No. 24.

¹⁵ Alber. *Inaugural Dissertation*, Wurzburg, 1894.

¹⁶ Kossler. *Berliner klin. Woch.*, April 8 and 15, 1895, Nos. 14 and 15.

albuminuria and cylindruria occurred together, whence he distinguishes two types of cylindruria, (*a*) degenerative and (*b*) inflammatory. He has observed in scarlatina, as had Baginsky in diphtheria, febrile albuminuria, followed by cylindruria with nucleo-albuminuria and, finally, by nephritis with albuminuria. In the past four years I have observed three cases of generalized fleeting anasarca in which direct examination, as well as argument by exclusion, led me to diagnosticate angio-neurotic oedema. In one instance, seen with Dr. T. J. Watkins, a healthy man suddenly complained of swelling of the eyelids, and the next morning of swelling of the penis and scrotum. There was no venereal history nor lesion. A few hours later the feet, wrists, body, and lips swelled to an enormous extent. Examination of the urine gave acid reaction, 1020, normal quantity, and solids, no albumin, etc., and no casts nor formed elements in the fresh and centrifuged sediment. A circum-spect diagnosis of angio-neurotic oedema was made. Recovery was complete in a few days. The case is presented without comment other than that it might have been a nephritis without cylindruria and albuminuria.

The chief considerations and conclusions of the paper may be summarized as follows:

1. Carefully repeated routine chemical and microscopical examination of the urine every twenty-four hours usually, but not invariably, detects acute and chronic nephritis.
2. The diagnosis of the albuminuric and non-albuminuric types of the nephritides is aided by searching examination of other viscera and parts, *e. g.*, by disclosure of cardio-vascular changes, retinal involvement, etc.
3. These visceral or somatic changes, usually present in nephritis, may be lacking in concrete instances or be capable of other or diverse interpretation, as polyuria, atheroma, etc.
4. The urinary findings, most essential to the diagnosis of nephritis, may be lacking, as may other signs and symptoms of minor dignity. Hence, as we fear instinctively, as it were, the existence of nephritis in certain cases before we examine the urine, so we may still fear its existence after negative urinalysis.
5. Nephritis may be unattended by albuminuria. Such nephritis is usually interstitial in type, of which cases abound in literature.
6. While certain instances of non-albuminuric nephritis correspond to the type described by Dr. D. D. Stewart, yet non-albuminuric nephritis may not exactly correspond to said type, since acute nephritis, chronic parenchymatous nephritis, and chronic interstitial nephritis may exceptionally occur without albuminuria.
7. Casts should always be searched for; they are more constantly found than is albumin, yet they seem in certain instances to betoken

renal degeneration rather than inflammation. They are not invariable in nephritis nor are they invariably nephritic:

8. Future clinical caution and pathological examinations will probably increase the number of cases of non-albuminuric renal inflammations of acute, subacute, and chronic types.

9. Non-albuminuric nephritis is of especial importance (*e. g.*, Stewart's type) in life-insurance and kindred examinations and in practice, since prophylactic measures may be instituted and the prognosis obviously influenced.

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THE SO-CALLED HYALINE BODIES AND OTHER CELLULAR DEGENERATIONS IN NASAL POLYPI.

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IN a paper (*New York Medical Journal*, November 13, 1897) read before the American Laryngological Association in 1897 I had occasion to refer to a case of adenoma of the nose occurring in the practice of Dr. F. W. Hinkel, of Buffalo. He had sent me a slide holding several microscopic sections from this rare nasal growth. These sections had been stained only with hæmatoxylin, and, although they served the purpose of illustrating certain phenomena with which that paper was concerned, they did not present the striking pictures of those objects with which this communication deals. The growth recurred, and Dr. Hinkel has sent me the portions removed by him, and for thus giving me an opportunity again for a study which is, at least to me, very interesting, I am deeply indebted to him.

Sections double stained with hæmatoxylin-eosin show that the growth has recurred again as a simple adenoma with a papillary surface, but with considerably more evidence of inflammatory changes. My attention was immediately arrested by the appearance in some of the papillary tufts of peculiar rounded or ovoid bodies, varying in size from that of a round white blood-cell to three or four times that diameter. These bodies were divided symmetrically by sulci, which refracted the light strongly into lobules compressed into polygonal shapes, apparently by a limiting membrane. They took the eosin strongly, and neither with the hæmatoxylin nor with any other stain used was there any appearance of a nucleus, although neighboring cells in the stroma reacted as usual to the double stain. The intersection of the light-refracting lines of the sulci occasionally gave the appearance of a distorted nucleus, but more careful examination revealed the true nature of the appearance. The sharp outlines of the bodies were apparently due to a cell-membrane, which, however, could never be satisfactorily made out. In some instances the lobules or granules lay scattered in the stroma, evidently from the bursting of this envelope or from its disintegration. This was not only observed in the case of the larger bodies, but was also seen in those of the smallest diameter. These bodies varied in number from one in a papilla to such a number that the whole stroma seemed filled with them, while in many of the tufts there were none at all. They bore no relation to the bloodvessels nor to the epithelium, although occasionally one of the bodies could be seen among the deeper epithelial cells of the surface. They were almost entirely confined to the stroma. They took the eosin stain, although apparently not so deeply as the stroma, this appearance being doubtless due to their translucency and their light-refracting properties. Sections stained with gentian violet and decolorized with the Gram-iodine solution failed to stain these bodies. No result was obtained from the iodine alone. Their amyloid nature may, therefore, be ruled out. Various other stains were used also unsuccessfully. Fuchsin alone did not differentiate them from the tissues. The following method, however, was eminently satisfactory. Thin celloidin sections were placed in a pale-red fuchsin (Grübler) solution, and left there a few minutes until deeply stained. They were then washed in water and placed in 95 per cent. alcohol in which a few crystals of picric acid had been dissolved. They were kept there until the deep-red fuchsin color had grown pale and indistinct to the naked eye. They were then washed thoroughly in absolute alcohol and clarified in oil of origanum. A little practice soon teaches the relative degree of stain to be secured. Examined immediately, most striking pictures are obtained, but after the lapse of a few days the sharp differentiation of the bodies is weakened. Promptly examined, these bodies are seen brilliantly colored with fuchsin,

and, by their refracting properties, plainly differentiated from all other objects, although the fuchsin stain lingers in the nuclei of the stroma cells, and to some extent in the stroma fibres and in the tips of the epithelial cells. Bodies such as these and in such profusion I had never noted before, although all of my more than 600 specimens from the nose and throat had been double-stained with hæmatoxylin-eosin. Realizing, however, that an occasional occurrence of such bodies might have escaped my notice, and in order to study my previous material in the light of the interest aroused by the observation of these structures, I have gone over the hæmatoxylin-eosin slides carefully, and where the

FIG. 1.



"Hyaline" bodies or "berries" taking eosin and fuchsin stain, but not hæmatoxylin.
Cam. lucid. obj. $\frac{1}{8}$.

appearances were suggestive I have cut fresh sections from the specimens and stained them with the fuchsin and the picric acid, and have made the following notes:

It soon became evident that while eosin stained these bodies there

were other more or less irregular areas in the stroma of various specimens which took the eosin and, to some extent, the fuchsin in such a manner as to make it likely that, so far as the stains were able to differentiate it, the material was identical. Homogeneous structureless plaques and irregular bodies are occasionally seen, especially among fibrous tissue taking this stain. It also seems evident that this same material is present in the various elements of normal structure. It must, however, always be borne in mind that analysis of albuminous material by stains is not by any means chemical analysis. It is, therefore, not the purpose of these notes to attempt to establish the nature of the material which goes to make up these peculiar bodies, but simply their pathogenesis and origin. The material may be hyaline or colloid, if these terms have any definite chemical meaning, or it may be something else; but it is highly probable that material of different chemical constitution and of varied biological origin may take the same reaction toward the aniline and other dyes. These observations, however, do reveal a certain sequence of morphological facts which forms an excuse for their publication. For the sake of convenience of description, the structures analogous to those seen in Dr. Hinkel's specimen will be called "berries," and other structureless material taking the same stain will be called "plaques."

No. 516. Papillary adenoma of the nose (Dr. Dickerman's case, also referred to in the former paper cited above). Part of this specimen was adenomatous and part of it was œdematous structure, perfectly typical of the ordinary œdematous polyp of the nose. The "berries" are seen in very small numbers in the adenomatous, but not in the œdematous portions of the growth.

No. 275. Adenoma of the nasal septum. Some small plaques, but no berries are to be seen.

No. 294. Adenosarcoma of the nasal septum. Nothing is to be seen of either form.

No. 540. Adenocarcinoma of the nose (Hopkins's case). None.

Beside the adenomatous material from the nose, I have examined slides from adenomata of other organs. Having none of the original material, these observations were made only on old sections stained with hæmatoxylin-eosin.

Adenoma of the Stomach. Some of the plaques are present, but no berries are distinctly made out. Some of the plaque material is free in the acini.

Adenoma of Mamma. Nothing except some material in the acini.

Adenoma of the Liver. There are some plaques in the lumina of the bloodvessels which look as though they might have been evolved from red blood-cells. They are very few in number.

Adenoma of the Orbit. Very large amount of the plaque material is seen in the stroma and in the lumina of the bloodvessels, taking the eosin stain deeply. No berries can be distinctly made out.

No. 520. *Alveolar Sarcoma of the Cheek.* Some plaques seen, but no berries. A large number of epitheliomata of the larynx, fauces, etc.,

were examined and the plaque material was always found, but no berries.

No. 617. An epithelioma of the fauces, which contains a very large number of cells, showing with hæmatoxylin the asymmetrical karyokinetic figures of which so much has been said lately by pathologists, shows also the plaque material abundantly, especially in and near the "whorls." Sections from this growth were stained with fuchsin-picric acid. These irregular plaques take and retain the fuchsin stain deeply, especially the "hyaloid" bodies at the centre of the whorls; but the fuchsin shows what the eosin does not—that there are shining light-refracting granules in and near these plaques. The karyokinetic figures which took the hæmatoxylin stain here take the fuchsin deeply. On the whole, therefore, these malignant epithelial growths show fuchsin bodies which differ from any others which I have seen, but none of the berries are to be found. While I am not disposed to accept the theory of the parasitic origin of these bodies or plaques, I am not inclined to enter into a discussion of their significance further than to say that I believe they are the results of degenerative changes in the cells.

No. 155. Œdematous nasal polypus. One or two berries are seen, and one of them has a nucleus. Some irregular plaques are noted in the bloodvessels.

No. 179. Œdematous nasal polypus. Irregular plaque.

No. 317. Œdematous nasal polypus, which contains *eosinophilous cells*. In places there are structures which resemble berries somewhat.

No. 367. Œdematous nasal polypus, with inflammatory areas. One or two characteristic berries may be seen; these have nuclei.

No. 396. Œdematous nasal polypus. Irregular plaques.

No. 410. Œdematous nasal polypus; girl of fourteen. Some plaques looking as though the material had oozed from connective-tissue cells.

Nos. 456 and 460. Œdematous nasal polypi with *eosinophilous cells*; show no appearance of plaques or berries.

No. 503. Chronic inflammation of the mucous membrane of the middle turbinated bone. One characteristic berry was seen.

No. 553. Chronic inflammation of the mucous membrane of the inferior turbinated bone. Plaques are seen in the lumina of dilated glands.

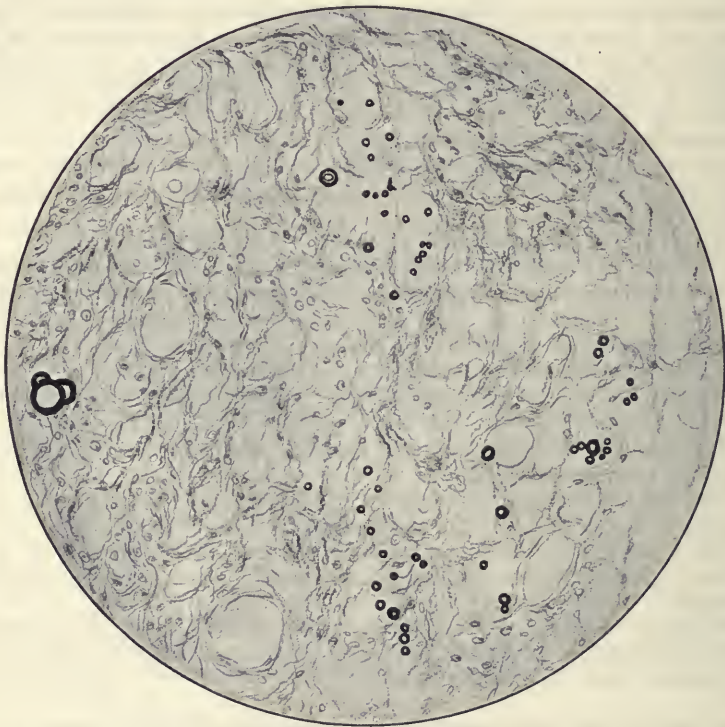
No. 580. Fibrous angioma of the tonsil. In the fibrous tissue there are some irregular plaques. They take the fuchsin stain and appear to be derived from the fibrous tissue.

Having briefly noted suggestive appearances found in a few of the large number of sections of the many and varied growths examined, it is necessary to remind the reader that it would be impracticable to detail all of the accessory observations which have helped me to form a tentative opinion as to the nature and derivation of these berries, so strikingly apparent in Dr. Hinkel's specimen. This opinion can, perhaps, be better explained in connection with the description of certain appearances noted in the following growth:

No. 591. Œdematous nasal polypus. Woman, aged sixty-three years, who gave a history of having had the growths for a good many years.

Microscopic examination shows great degeneration of the stroma and œdematous infiltration. There are some bodies which closely resemble the berries, and these evidently come from the round cells of the connective tissue. They are larger than the latter and do not take the hæmatoxylin stain. The little lobules, which are here so fine that they may be called granules, are not so regularly arranged as in the berries. There are no nuclei to these bodies. The cell membrane seems to have disappeared, but the granules grouped together keep a globular shape, apparently from agglutination. These bodies or cells take the fuchsin stain moderately.

FIG. 2.

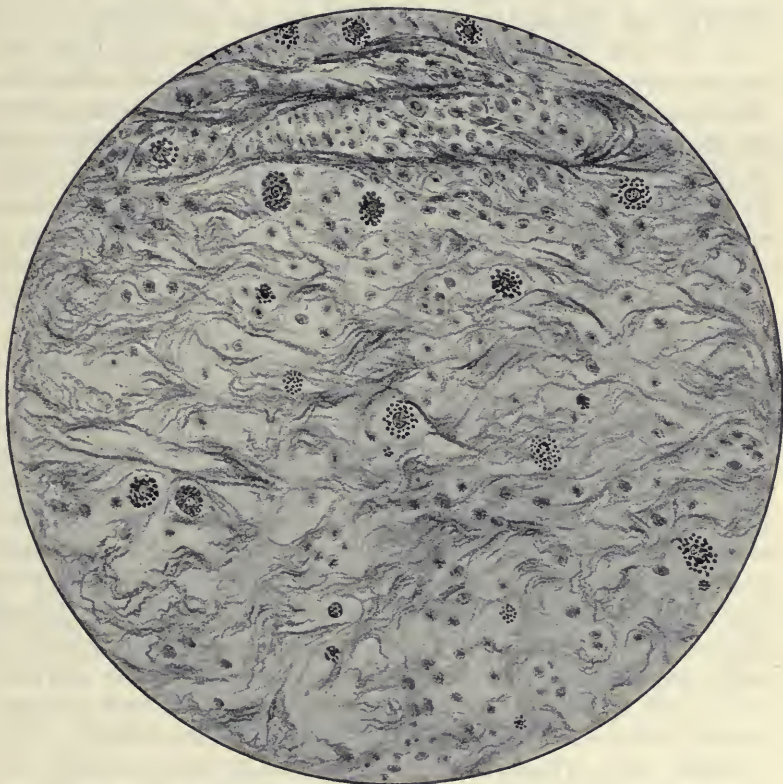


Hyaline drops or separate globules taking eosin and fuchsin stains, but not hæmatoxylin.
Cam. lucid. obj. $\frac{1}{6}$.

In this polyp, however, are seen bodies which I have before occasionally observed, but they have not been so frequently nor so plainly seen as to be studied properly. These are perfectly globular bodies ranging in size from such minute dimensions that they can hardly be seen with the $\frac{1}{12}$ ol. im., to thrice the size of a white blood-cell. They are at all stages perfectly structureless. They lie free in the stroma, sometimes near together in clumps, sometimes singly. Usually

with the $\frac{1}{2}$ ol. im., around one of the larger globules may be seen the exceedingly minute grains. I occasionally can make out one or more of these granules shining in a cell body, all the rest of the cell having lost its fuchsin by the action of the picric acid. When the larger globules happen to lie close enough to one another in the tissues, they impinge upon one another, so that their proximal surfaces are

FIG. 3.



"Hæmatoxylin cells," taking the hæmatoxylin and fuchsin stains, but not the eosin.
Cam. lucid. obj. $\frac{1}{6}$.

flattened. They apparently may also be compressed by the impingement of the contiguous structure in the stroma.

After a careful study with various stains it is apparent that these globules free in the tissues are identical with the globules seen in the structures I have called "berries." This brings me, as said above, to the following tentative explanation: From some unknown cause, depending on defective nutrition brought about in the course of inflammatory or

analogous metabolic changes, other parts of the cell body and nucleus lose their vitality. These minute granules under the conditions which have caused death to the other parts of the cell grow abnormally. If two of the granules survive and grow, and the cell membrane is still intact, we will have a bilobed body; if three, a trilobed body, and if many, a multilobed body held together by the cell membrane, which may, however, burst at any stage of the development, and the swollen granules may thus be scattered in the stroma. Where the cell with its membrane has died and become disintegrated and left behind only one or more of these minute granules still alive in the tissues, the latter may begin to grow, and, being unhampered by a cell membrane limiting their own expansion and holding their fellows in apposition, they assume the globular form. I believe the cells which usually furnish these granules are the round wandering cells of the connective tissue. With this explanation it is not difficult to understand why some of the berries may retain enough of the nuclear material to take the hæmatoxylin stain and so furnish a nucleus, while in others none of it has remained.

Certain other phenomena in the histology of morbid nasal growths seem to have a more or less direct bearing upon those just detailed.

Three years ago Dr. John Dunn, of Richmond, sent me a nasal growth from the inferior turbinated body which, on examination, proved to be a very much degenerated hypertrophy of the mucous membrane. Scattered through the stroma were coarsely granular ovoid masses taking the hæmatoxylin stain very deeply, and twice or thrice the size of a white blood-cell. They looked like colonies of micrococci. At that time I was unable even to form a conjecture as to their nature. Simultaneously with the beginning of my study of the "hyaline bodies" I received from Dr. J. H. Bryan, of Washington, an hypertrophy of the inferior turbinated body similar to that from Dr. Dunn, and containing the same bodies deeply stained with hæmatoxylin. They do not take the eosin stain at all, and are thus sharply differentiated from the "hyaline" bodies. They are also more ovoid and the granules are finer than in the "berries" in Dr. Hinkel's case. Stained with fuchsin-picric acid they take the fuchsin color deeply and brilliantly. Some of these bodies were contained in a cell membrane; in some the cell membrane had disappeared. Small, loose granules were seen on the stroma, but in no place was there any evidence of growth of these granules after they had lost their protecting cell membrane. Very little study convinces one that these bodies also are degenerated round connective-tissue cells, which for some reason take the hæmatoxylin stain as deeply in the cell body as they do in the nucleus, and in which certain kinds of granules have greatly increased in numbers, but only moderately in size. When the cell membrane is lost these granules cease to grow. For convenience

sake we may call these hæmatoxylin cells. In examining my collection of slides these or analogous cells were looked for. They were occasionally found, but nearly always in the œdematous hypertrophies of the inferior turbinated bodies.

The cases of Dr. Dunn and Dr. Bryan have already been mentioned

No. 562. Œdematous hypertrophy of the posterior end of the inferior turbinated body shows these hæmatoxylin cells, but they are not so large or so granular as in the specimens mentioned above. They take the fuchsin stain very deeply, much more deeply than do the other cells of the connective tissue.

No. 646. A fibrous hypertrophy of the mucous membrane of the inferior turbinated bone in a syphilitic patient contains the hæmatoxylin cells. They take the fuchsin stain deeply and are coarsely granular. It is noted that the larger these granules are, the less distinctly is the nucleus seen. The cell membrane is not distinct, and in some instances seems to have disappeared. Most of them are ovoid in shape. They are mostly in the stroma, but in places they may be seen among the glandular epithelium. Neither in this nor in any of the other specimens do these hæmatoxylin cells show any karyokinetic figures.

Nos. 566, 571, 589. Œdematous nasal polypi. These show some of the hæmatoxylin cells, ovoid in shape. Some of them, usually very large, are to be seen amidst the detritus in the dilated lumina of the glands. They react as usual to fuchsin.

No. 615. Œdematous nasal polypus. Some ovoid non-nucleated granular cells are present which take the eosin stain. They do not take the fuchsin stain very deeply.

No. 406. Mucous membrane and bony tissue from the inferior turbinated bone in a condition of chronic inflammation. In this specimen are seen large granular nucleated cells, ovoid in shape, situated also in the stroma, but especially in the lacunæ of the bony tissue. They resemble the hæmatoxylin cells in their shape and size, and in the coarseness of the granules, but they take the hæmatoxylin and eosin stains like normal cells. In places there are a number of them together. They take the fuchsin stain moderately.

Nos. 458, 559. Bony cysts of the middle turbinated bone show the same cells.

To sum up briefly the conclusions I have arrived at from the study of these phenomena it may be said: Under the influence of disturbed nutrition some of the elements in the wandering cells of the connective tissue lose their vitality, while certain others take on an abnormal growth.

A. "Berries" and "Globules." 1. The granules which in the normal cell body take the eosin stain may grow in size to completely fill the cell membrane, and from the disintegration of the cell membrane may then be scattered; or

2. These granules lying free in the tissues after the disappearance of the cell membrane and the other parts of the original cell may then take on active growth.

In the first instance we have the hyaline bodies which I have called "berries." In the second instance we have the bodies which I have called "globules."

B. Material outside of the cells taking similar stains may be found in low-grade fibrous tissue, and especially in the peculiar homogeneous bodies of epitheliomata.

C. Under the influence of disturbed nutrition in the wandering cells there may occur, on the other hand, an overgrowth of the granular material which in the normal cell takes the hæmatoxylin stain, increasing in number, but not markedly in size. The nucleus in these cells may be present or absent. There is no evidence that the vitality of these granules survives the disintegration of the cell membrane.

D. While in both of these varieties of cellular degeneration the material of the granules takes the fuchsin stain deeply, they differ in their reaction toward the hæmatoxylin stain.

In the preceding account I have purposely avoided reference to the works of others concerning these phenomena which have of late attracted considerable attention. Some confusion has arisen because of the impossibility of identifying the structures spoken of by the various writers, and because it is not always clear as to whether the discussion refers to the "hyaline" or "colloid" material or to the biological structures in which it occurs. It has, therefore, seemed best that I should only detail above my own observations and conclusions, but any one familiar with the previous literature of the subject will easily perceive to what extent these have been influenced by the contributions of Thorel, Hansemann, Polyak, Stepanow, Seifert and Kahn, and others.

The "hyaline" bodies which I have called "berries" have been most frequently found and studied in polypi of the stomach and intestines, especially in adenomatous growths of the mucous membrane of these organs.

Thorel found them more abundantly according to the degree of inflammatory changes. He is of the opinion that they are due to the development of the granules in degenerated cells. As has been seen, I have come to the same opinion. Hansemann also found them constantly in growths of the stomach after his attention had been once drawn to them. He also believes them the product of cellular degeneration. Polyak seems to have had an experience similar to my own. After having examined a large number of nasal neoplasms without noting their occurrence, he found that in a case of "papillary and polypoid hypertrophy" of the mucous membrane these bodies were present in

very large numbers. In both sides of the nose in this case there existed growths (on one side a papillary hypertrophy of the mucous membrane of the inferior turbinated bone, in the other side œdematous polypi of the middle turbinated region), which were found on microscopic examination to contain these bodies. He used various stains, but came to practically the same conclusions as other authors in regard to their origin from cellular degeneration; but among his other deductions he is somewhat positive that the material in them is identical with the "colloid" of struma or goitre. Seifert and Kahn, in their beautiful *Atlas of the Histopathology of the Nose* (Taf. II., Fig. 4), show what are apparently the hyaline bodies (berries) as well as cells which I have called hæmatoxylin cells, occurring in a specimen from a case of acute rhinitis. A more extended study of the histology of this condition of the nasal mucous membrane might do much to elucidate the subject of the hyaline degeneration of cells.

Stepanow's investigations, dating back to 1891, seem to have convinced him that bodies similar to these found in rhinoscleroma are to be observed in various nasal growths, such as polypi, hypertrophies, adenoids, etc.

Other contributions to the literature of the subject which I have not read in the original are also noted below.

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REVIEWS.

TRAITÉ DE CHIRURGIE CLINIQUE ET OPÉRATOIRE. Publie sous la direction de MM. A. LE DENTU et PIERRE DELBET. Tome sixième ; 8vo, pp. 952. Paris : J. B. Baillière et fils, 1898.

TREATISE ON CLINICAL AND OPERATIVE SURGERY. By LE DENTU and DELBET.

A SURGERY which has extended to six volumes of nearly a thousand pages each, with a number more to come, may reasonably be expected to be complete. Like almost all French books, it is impossible to find in it any special topic about which one wishes to consult it, in view of the fact that there is no index. But in looking somewhat carefully through its pages, especially to see whether some important and particularly some recent subjects have been at all fully treated, we must confess to not a little disappointment. For instance, Tumors of the Sternum, which in an encyclopedic work like this should certainly receive a full consideration, are merely touched upon. The whole subject of Tumors of the Thoracic Wall, including those of the soft parts and of the bones, is dismissed in three pages. So, too, Tumors of the Mediastinum have less than two pages, while Hernia of the Lung occupies nearly ten. Diverticulum of the Oesophagus, the operative treatment of which has received considerable attention of late years, is fully considered and proper treatment given. Under the heading of Foreign Bodies in the Oesophagus, the whole matter of diagnosis by means of the Röntgen rays is dismissed in eight lines. It begins: "Finally, Aragon has recently taken advantage of radiography in order to discover the presence of a coin fixed in the oesophagus in a child." As if Aragon were the first and, indeed, the only one, who had ever done so. Not even an allusion is made to the scores of cases reported in the journals of all countries both before and since Aragon's use of it. Not a word is said about the ingenious method of removing such bodies as published by White and Wood in 1896. Inasmuch as this volume bears the imprint of 1898, it surely should cover the literature of 1896. Under Foreign Bodies in the Larynx, nothing is said in reference to the use of the x-rays.

Naturally, one of the topics a reviewer would look at is the modern surgery of the alimentary tract. A system as large as this should give one all necessary information, including operative procedures, sufficiently well illustrated to enable any surgeon to perform such operations. Yet we find that under Gastrostomy (where he misspells the name Egberg), there are less than six pages, and among the operative procedures the only one described at length and illustrated by a single cut is that of Terrier, which nobody does at the present time. There is not a single illustration of either of the methods of Witzel or Ssabanajew-Frank. Even the operation of Witzel is wrongly described, the procedure of

Marwedel being the one described under this name, though Marwedel's name is not mentioned.

The chapter on the Treatment of Goitre is modern, and is good, with one exception. The recent operations of Jaboulay and Jonnesco, of resection of the cervical sympathetic for exophthalmic goitre, are mentioned, though no reference is made to the earlier work of Alexander on the same nerve in epilepsy. Jonnesco especially has insisted on the difficulties of removing the inferior ganglion of the sympathetic, and has copiously illustrated his own papers on this subject in order to help the surgeon. Not a single cut, nor any such detailed description which would enable the surgeon to avoid the dangers and accomplish the result in view, is given.

The want of an index is very well illustrated in reference to Cervical Ribs. If one wishes to hunt up what is said on this subject he will find in the *Table des Matières*, under Diseases of the Neck, Section 5, Tumors of the Neck, Part I., Solid Tumors; and then, on reference to the text, will find among others mentioned Osseous Tumors, and among these Cervical Ribs. Pathologically, surely a cervical rib is not an "osseous tumor." If one desired to look up what was said in reference to such anomalies of development, the last title under which he would look would be "Osseous Tumors." Similarly, should one desire to consult this work on Fistulæ of the Neck, and Persistent Thyreoglossal Duct, the only probable title in the table of contents is "Liquid Tumors of the Neck;" and on turning to this, while considerable is said as to congenital cysts, and there is a short paragraph on the relation of these cysts to the lymphatic system, not a word is said as to the congenital fistulæ, and not a word as to the thyreoglossal duct. Under Diseases of the Tongue we do find a discussion of the latter, but we have been unable to ferret out anything about branchial fistulæ.

There is a great deal in this book that is good; but on the whole it is disappointing. Much of it is diffuse; little of it can be referred to by a busy man at a moment's notice; and what is omitted is more striking than what is found. Although the book contains nearly a thousand pages, and is called a "Treatise on Surgery, both Clinical and Operative," yet in all these pages illustrating pathology, pathological and normal anatomy, and operative procedure, there are only a little over a hundred cuts, and most of these are poor.

W. W. K.

ATLAS AND ABSTRACT OF THE DISEASES OF THE LARYNX. By L. GRÜNWALD, of Munich. Authorized Translation from the German. Edited by CHARLES P. GRAYSON, M.D., Lecturer on Laryngology and Rhinology in the University of Pennsylvania; Physician-in-Charge of the Throat and Nose Department, Hospital of the University of Pennsylvania. With 107 colored figures on 44 plates. Philadelphia: W. B. Saunders, 1898.

THIS is an excellent practical handbook, giving the main points in the diagnosis, pathology, and treatment in the various diseases of the larynx, and without any elaboration, the colored plates being very effectively drawn and nearer to nature in tint than most of those seen in recent publications. The descriptions accompanying the plates are admirable, concise, and sufficient. The translation is in good English.

J. S. C.

DIE STÖRUNGEN DES KREISLAUFS UND IHRE BEHANDLUNG MIT BADERN UND GYMNASTIK. Von DR. S. CH. GRAUPNER, Arzt in Bad Nauheim. Pp. 158. Berlin: S. Karger, 1898.

DISORDERS OF THE CIRCULATION AND THEIR TREATMENT BY BATHS AND GYMNASTICS. By GRAUPNER.

THIS work seeks for the physiological explanation of the results obtained in the treatment of diseases of the circulation by the methods employed at Nauheim—baths and gymnastics. Believing that the vagus is the trophic nerve of the heart, and disputing the axiom frequently encountered, that increase of heart work of itself tends to tissue improvement, the author travels over the well-beaten road toward the end of demonstrating the value of the methods now thoroughly vulgarized in medical literature. To be sure, his treatment of the subject is often novel and his conclusions somewhat diverse from those commonly met with. While agreement may not be reached as to the way by which results are obtained at Nauheim, all authors writing from the stand-point of the bath-physician claim that benefit is derived from them. Most seem to attribute much to local influences, as if physiological laws were modified at Nauheim. The position of these extremists is rendered untenable by recent investigations, which tend to show that gymnastics are more potent than baths, and it would be further than a partisan would care to go to assume that well-known gymnastic principles are only of local application. In comparison with much that has been written upon this subject—and we have especially in mind a British production—this book has made a substantial advance, and we trust that such studies will continue until theories shall rest upon a substantial basis, accepted by all, and the treatment escape from empiricism. We have seen much good result from the methods practised at Nauheim, but too dogmatic and inflexible rules savor of suggestive therapeutics.

R. W. W.

HANDBUCH DER ANATOMIE DES MENSCHEN. Von PROF. KARL VON BARDELEBEN, in Jena. V. Band, II. Abtheilung: 1. Das Aussere Ohr, von Prof. W. G. Schwalbe, in Strassburg. 2. Mittelohr und Labyrinth, von Prof. W. F. Siebermann, in Basel. Jena: Verlag von Gustav Fischer, 1898.

HANDBOOK OF HUMAN ANATOMY. THE EAR. By KARL VON BARDELEBEN.

It is hardly possible to praise too highly this part of Von Bardeleben's *Human Anatomy*. The first division of the second part of the fifth volume is on the External Ear, by Schwalbe, and is illustrated by thirty-five partly colored engravings, incorporated in the text, which consists of seventy-four pages. It is marked throughout by clearness and accuracy, and is as instructive as anything short of dissection can be. The second division of this same volume is on the Middle Ear and Labyrinth, by Siebermann, a celebrated author upon the anatomy of the internal ear. It consists of 137 pages. The comparative anatomy of the ear and the methods of making corrosion preparations of the ear are given first, and then the anatomy of the middle ear and of the laby-

rinth are given most elaborately and most attractively, with 66 partly colored illustrations, incorporated in the text. It is, indeed, difficult to say which of these illustrations is the most beautiful and most graphic. We would like, however, to draw attention to Fig. 31, on page 254, illustrating a corrosion preparation of the entire middle ear, as being especially instructive. Among the illustrations of the labyrinth Fig. 62, showing the entire membranous labyrinth, and Fig. 65, delineating a horizontal section through the right cochlea, deserve especial mention for their beautiful, delicate, and instructive drawing and coloring. The text of this work is useful only to the German scholar, but the illustrations are worth the price of the fasciculus to any student of anatomy. Authors and publishers deserve our highest praise for the way they have discharged their respective duties.

C. H. B.

THE CÆCAL FOLDS AND FOSSE AND THE TOPOGRAPHICAL ANATOMY OF THE VERMIFORM APPENDIX. By RICHARD J. A. BERRY, M.D., F.R.C.S., F.R.S. Edin., Lecturer on Anatomy, etc. 8vo, pp. 75, 17 plates. Edinburgh: Wm. F. Clay, 1897.

THIS monograph contains the results of a systematic and scientific study of some of the anatomical relations of the cæcal and appendicular region. While the folds and fossæ are primarily of interest to the anatomist, the surgeon has much need of correct information concerning this region. The photographic plates from original specimens are most valuable additions to the text. The author has epitomized the opinions and results of other writers. These, added to his own observations, make the little volume a contribution of marked value. His effort to simplify classification and nomenclature is certainly laudable. His previous contributions on the Anatomy of the Cæcum and Appendix and on the Pathology of the Appendix, show how carefully he has studied this region of the body.

His remark about the retro-colic fossæ will bear quotation: "Surgically the fossæ are of the greatest practical importance. Every surgeon should be perfectly familiar with their anatomy, because, should he persist in attempting to remove a chronically inflamed appendix, buried in adhesions and lying in one or another of the retro-colic fossæ, he may be sacrificing the life of his patient to a lack of knowledge."

Among his conclusions are these: "The pericæcal folds are primary in origin and vascular in function. The ileo-colic and ileo-cæcal folds together represent the mesentery of the cæcum, the meso-appendix being the true appendicular mesentery." . . . "The meso-appendix is constantly present and is normally situated in about 75 per cent. of cases. When normal it is quadrilateral in outline; when abnormal it may assume almost any shape or situation. In 6 per cent. of its abnormalities the meso-appendix is so placed as to anatomically predispose the subject to appendicitis.

"The meso-appendix envelops the appendix throughout, and may be the seat of an internal hernia or the cause of an intestinal obstruction."

J. B. R.

ATLAS OF METHODS OF CLINICAL INVESTIGATION, WITH AN EPITOME OF CLINICAL DIAGNOSIS AND OF SPECIAL PATHOLOGY AND TREATMENT OF INTERNAL DISEASES. By DR. CHRISTFRIED JAKOB, formerly First Assistant in the Medical Clinic at Erlangen. Authorized translation from the German. Edited by AUGUSTUS A. ESHNER, M.D. Professor of Clinical Medicine in the Philadelphia Polyclinic; Physician to the Philadelphia Hospital, etc. With 182 colored illustrations upon 68 plates, and 64 illustrations in the text. Philadelphia: W. B. Saunders, 1898.

THE mode in which the title of the heathen deity, Atlas, came to be transferred to a bound collection of maps or plates is of great interest from a philological stand-point, but does not immediately concern us. Suffice it to say that the term Atlas applied to this work is somewhat misleading, inasmuch as it is commonly used to designate unwieldy and expensive folios, whereas neither of these adjectives can be employed in connection with this admirable manual of Dr. Jakob. With the original some of us are already acquainted, but this does not diminish our obligation to the editor and publisher who have introduced it in the vernacular to the mass of students and practitioners.

This is a book which stimulates the young student and practitioner to renewed diligence in the clinical investigation of disease and causes the veteran to regard his antique microscope with affection and to make resolves, never to be fulfilled, concerning its future employment.

It is difficult to select any of the numerous illustrations for special commendation, for they are all excellent. To the writer the plates illustrating the blood in health and disease, the blood spectra and the blood parasites, seem especially noteworthy; while to others, doubtless, the same would be true with reference to the color reactions of the gastric juice, the crystalline and organized sediments of the urine, or the microscop of the sputum.

The plates are admirably supplemented by the Epitome of Clinical Diagnosis, and the entire work, index included, is contained in a small octavo of 259 pages.

F. P. H.

PRAXIS DER HARNANALYSE. ANLEITUNG ZUR CHEMISCHEN UNTERSUCHUNG DES HARNS, NEBST EINEM ANHANG, ANALYSE DES MAGENINHALTS. Von PROF. DR. LASSAR-COHN. Hamburg und Leipzig: Leopold Voss, 1898.

PRACTICAL GUIDE TO URINALYSIS, WITH AN APPENDIX ON THE ANALYSIS OF STOMACH-CONTENTS. By PROF. LASSAR-COHN.

IF we thought the author possessed a sense of humor, we should consider this a satire on the medical profession. There are dozens of books in every civilized language on the analysis of urine, fully covering the chemical, pathological, and clinical questions involved. Medical graduates are supposed to have the essentials as given in this booklet at their finger-tips. Yet the fact remains that many physicians rarely, and some never, use these manipulations in practice. The author intimates that this is true of Germany, and we hope he is right in concluding, from the rapid sale of the first edition, that his book will change all that. In plain and untechnical language, aside from a couple of simple chemical

formulæ, he gives tests for albumin (heat and acetic acid), glucose (Trommer's), acetone (Legal's), aceto-acetic acid (Gerhardt's), bile (Gmelin's), urobilin (Jaffe's), blood (Heller's), indican (Jaffe's), sulphates, conjugate sulphates, phosphates, and ammonia. Quantitative tests are given for albumin (weighing and Esbach's), sugar (Fehling), and total and combined sulphates. The appendix describes Günzburg's test, the lactic-acid test with chloride of iron, and artificial digestion. There is no attempt at clinical explanations and very little suggestion of chemical principles. The directions for making artificial abnormal urines might be useful for those who never studied chemistry. Not without interest are the advertisements of the work printed on the cover, containing laudatory reviews from pharmaceutical and chemical journals. G. D.

AN AMERICAN TEXT-BOOK OF GENITO-URINARY DISEASES, SYPHILIS, AND DISEASES OF THE SKIN. Edited by L. BOLTON BANGS, M.D., and W. A. HARDAWAY, A.M., M.D. Pp. 1229. Illustrated with 300 engravings and 20 full-page colored plates. Philadelphia: W. B. Saunders, 1898.

THE work is divided into two parts, nearly 800 pages being devoted to genito-urinary diseases and syphilis, and over 400 pages to diseases of the skin. The reason for considering in a text-book two subjects so dissimilar as genito-urinary diseases and cutaneous diseases has never been satisfactorily explained. It has been done in the past, and is still done in the present, as the volume under notice testifies; but we deplore the fact, for the reason that the subjects have so little in common either from a scientific or a practical aspect. We believe that authors generally are opposed to the amalgamation of these two departments of medicine. The publishers, however, view the matter differently, with the result that the subjects still continue to be discussed together in the same volume, to the detriment of both.

In the present case the work has been well done by all who have contributed to the volume, which may be said to contain a series of practical monographs on all the diseases which pertain to the two specialties. Dr. Bangs, in connection with genito-urinary diseases, and Dr. Hardaway, with diseases of the skin, are both most favorably known through their labors in the past, and in editing the volume before us they have shown both good judgment and skill. The contributors to genito-urinary diseases comprise Paul Thorndike, on "Urine Analysis, and a Consideration of the Urine in Surgical Diseases of the Urinary Tract;" B. Farquhar Curtis, "Diseases of the Penis;" G. Frank Lydston, "Diseases of the Male Urethra;" Eugene Fuller, "Diseases of the Testicle and its Coverings, the Cord, and the Seminal Vesicle;" J. William White, "Diseases of the Prostate;" Edward Martin and A. E. Taylor, "Diseases of the Bladder;" Francis S. Watson, "Vesical Calculus;" Christian Fenger and S. C. Stanton, "Diseases of the Ureter;" P. R. Bolton, "Surgical Diseases of the Kidney;" James Pedersen, "Functional Disorders;" James S. Howe, "Acquired Syphilis;" Lewis C. Boshier, "Syphilis of the Bones, Joints, Bursæ, Tendons, and Muscles;" J. H. Linsley, "Syphilis of the Respiratory, Circulatory, Lymphatic, and Alimentary Systems;" Graeme M. Hammond, "Syphilis of the Nervous System;" Thomas R. Pooley, "Syphilis of the Eye;"

Abraham Jacobi, "Hereditary Syphilis;" Robert Holmes Greene, "Treatment of Syphilis;" and James S. Howe, "Chancroids." Thus we note a long list of names, all of the writers being well qualified to discuss the topics allotted to them. It would be unjust to single out articles for special remark, because most of them are admirable, but that on Urethritis (a test chapter) is particularly attractive. We are sure that no physician can read any of the monographs without becoming acquainted with the newest observations in the field discussed. Drs. White and Wood give a valuable exposition of the diseases of the prostate, a subject to which Dr. White has made valuable contributions, the operation of prostatectomy being elucidated *in extenso*. The several aspects of this operation, pro and con, are presented with remarkable fairness. The conclusion is reached that castration for hypertrophied prostate has passed the experimental stage and has established for itself a place among legitimate operative procedures.

The part of the work devoted to diseases of the skin is as well done as that part already considered. Such well-known observers and dermatologists as have labored in this department could not fail to produce admirable results in the way of short, practical monographs on the more important diseases. The chapter on "Eczema," by Dr. Hardaway, is well written, and bears the stamp of a practical writer who loses sight of nothing that bears on the general pathology, etiology, and treatment of the disease. John T. Bowen writes clearly on the "Anatomy and Physiology of the Skin," and Charles W. Allen contributes "General Symptomatology," and D. W. Montgomery "General Etiology, Pathology, and Diagnosis." I. E. Atkinson, C. W. Allen, D. W. Montgomery, A. R. Robinson, J. M. Winfield, H. G. Klotz, M. B. Hartzell, W. A. Hardaway, and Joseph Grindon all share in ably handling the various inflammatory diseases. John T. Bowen writes on the "Hemorrhages," and J. Abbott Cantrell and E. J. Stout and F. J. Shepherd contribute the chapter on the "Hypertrophies." Condict W. Cutler writes the chapter on "Atrophies," while that on the "Neoplasmata" is mainly in the hands of James C. Johnston, S. Pollitzer, R. W. Taylor, J. A. Fordyce, Isadore Dyer, A. R. Robinson, and H. Tuholske. The chapters on the "Diseases of the Appendages" are contributed by Louis Heitzman, A. R. Robinson, George T. Jackson, H. N. Lyon, and W. T. Corlett. The articles on the "Parasitic Diseases" are from the pens of W. T. Corlett and A. E. Regensburger. We have looked over this portion of the volume with attention, and find the work done to be as satisfactory as it is possible to be where so many authors are concerned in its elaboration. As in all so-called "Systems," the chapters are really short monographs with no special relation one with another as to views on general pathology or treatment. The result, nevertheless, gives a practical volume, which is undoubtedly valuable and useful. The book as a whole is a large, ponderous, and handsome volume, illustrated (but not very fully, compared with other similar books of the day) with drawings, photographs, and colored plates. Most of the latter are rather poorly executed and fail to depict the diseases as well as they should do. Those on the syphilodermata are altogether inferior, and are unworthy a place in a volume so handsomely got up in other respects. We congratulate the editors and the contributors upon the successful completion of so great an undertaking, and bespeak for the volume a large circulation.

L. A. D.

THE PSYCHOLOGY OF SUGGESTION: A RESEARCH INTO THE SUBCONSCIOUS NATURE OF MAN AND SOCIETY. By BORIS SIDIS, M.A., Ph.D., Associate in Psychology at the Pathological Institute of the New York State Hospitals. With an introduction by PROF. WILLIAM JAMES, of Harvard University. New York: D. Appleton & Co., 1898.

RECENT psychology has an abundant literature. Wundt, James, and its other distinguished exponents should be gratified by the activity of their many disciples. The book before us is one of the best outcomes of this activity. It differs from many books on the same and similar subjects in its method of discussion. It is also original in some of the points of view taken by the author.

This book commends itself not only to psychologists, but also to physicians, and especially to alienists and neurologists, for whom it contains many suggestions, both as to the nature of some diseases of the nervous system and also as to their diagnosis, prognosis, and treatment. In this connection, one of its most practical aspects comes out in the discussion of the types of amnesia. The author shows, for instance, that amnesia may be normal and merely temporary and functional; or it may be irretraceable and curable; or it may be absolute and incurable, and more than this, he believes that he can demonstrate that it is possible, by making use of the methods of the psychologist, to differentiate these forms of amnesia, to refer them to their anatomical and physiological bases, to separate the curable from the incurable, and to treat the latter by special methods which arise out of investigations into the psychical nature of the subjects of the amnesia. The cases which he adduces to illustrate this position are of great interest, and in most respects convincing.

Another of the practical aspects of the work is where the author considers the relations of the subconscious to insanity, showing, as he believes, how in hypnotic and post-hypnotic conditions we hold the keys to the forms of conceptional and impulsive insanity. The nature or mechanism of imperative concepts, insistent ideas, and uncontrollable impulses is best understood by a study of conditions of normal and abnormal suggestibility and comparative studies of the conscious and subconscious self. It is held that those forms of insanity which are exhibited by insistent ideas, imperative concepts, irresistible impulses, and changes of personality have at their basis a disaggregation of consciousness, a dissociation of the primary and secondary subconscious selves. While we are not prepared to fully admit this thesis, the view is a highly suggestive one, and points the way to the proper study of the abnormal mental phenomena of these disorders. The methods adopted by Sidis for testing the subconscious memories, and of treating cases of amnesia, are worthy of the practical physician's attention. He also refers to methods used by him to run together into one the alternating personalities which are exhibited by some of the most extraordinary of the amnesic cases.

We have referred to some of the practical aspects of this book first because we are addressing ourselves to medical readers. The entire work is, however, worthy of careful and close reading. Occasionally diffuse and repetitive, the author is, as a rule, direct and lucid. In some places he shows an unusual facility in making clear some of the abstruse terms and propositions of modern psychology. Nowhere have we seen a clearer presentation of the true meaning of suggestion and suggestibility. He defines suggestion as the intrusion into the mind of an idea;

met with more or less opposition by the person ; accepted uncritically at last ; and realized unreflectively, almost automatically.

The book has a brief but interesting introduction from the pen of Prof. William James, in whose laboratory at the Harvard University much of the work embodied in the book was done.

Sidis has an interesting but just comparison of the merits of the German and French schools of psychology. As he states, the French care more for clinical cases than for the minute laboratory experiments which are so dear to the heart of the German. The German concept of the subconscious has been vague, and has rather the character of a mechanical than of a psychical process. The German results have been aptly characterized by James as the "elaboration of the obvious." The English and Americans, as well as the French, have worked along the lines of the subconscious with more insight if not in some directions with the same thoroughness as the Germans.

In Chapter III. Sidis discusses the subject of especial interest to the physician engaged in neurological practice—the treatment of nervous diseases in general, mental diseases, and those affections which are often referred to as on the borderland between sanity and insanity. He starts out with the dictum "that every man in his full, normal, waking state is more or less suggestible."

Normal suggestibility is directly the opposite of abnormal suggestibility; in the latter it varies as direct suggestion and inversely as indirect suggestion—that is, in abnormal subjects, as those suffering from grave hysteria or under hypnosis, the more direct the suggestion the more probable it is that it will be carried out ; while in the former it is inversely as direct, and directly as indirect suggestion. The normal man does not do what is suggested to him directly, either because he has too much sense or because he is too obstinate to follow the suggestion. The conditions of abnormal suggestibility, which are the same as those of hypnosis, are (1) fixation of attention ; (2) monotony ; (3) limitation of voluntary movements ; (4) limitation of the field of consciousness ; and (5) inhibition.

Sidis devotes a large part of one chapter to combating the sufficiency of Carpenter's doctrine of unconscious cerebration to account for the phenomena of hypnotic memory. His arguments on this score, while interesting, are scarcely of a convincing sort, and seem in some parts like a substitution of assertions for a more tangible hypothesis. To say that the phenomena are not a result of unconscious cerebration, but simply evidences of the existence of another self, is not an explanation of the phenomena.

Some of the interesting records of double and triple personality, both as exemplified in hypnotic subjects and in the records of unusual cases of periodic amnesia, are reproduced, and the subject of automatic writing and its bearing on the problems under discussion is considered.

He holds that much evidence can be adduced to show the presence of a subwaking self in a normal individual ; that the state of cleavage of personality and consciousness takes place not only in those who are hypnotic, but is more or less demonstrable in all normal individuals.

Part III., which applies the facts and theories of suggestibility to the study of society, will be found of interest to the general reader as well as to the student of psychology and psychiatry.

We can cordially commend this book to all who wish to keep pace with the most valuable of recent additions to psychological literature.

C. K. M.

PROGRESS OF MEDICAL SCIENCE.

THERAPEUTICS.

UNDER THE CHARGE OF

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The Use of Pyramidon in Diseases of the Nervous System.—DR. RUDOLF LANDENHEIMER reports upon the use of this antipyrin derivative in more than one hundred instances during the past year. In headache of undetermined origin, especially when occurring during convalescence from psychoses, five to eight grains gave relief after the lapse of one hour to two hours. It was equally successful in the headaches of alcoholics. In hysteria the results were uncertain, but for nervous men, those overworked and sleepless, the remedy gave satisfaction. The pain of alcoholic neuritis was not benefited, although the sensitiveness of the nerve-trunks was lessened. Of lumbago, two instances were benefited, a third unaffected by even large doses. Only two patients suffering from acute articular rheumatism came under observation. The pain speedily lessened, the swelling gradually disappeared. Chronic rheumatism was not benefited. The lancinating pains of tabes were temporarily benefited. The maximum dose given above can be safely administered thrice daily. Untoward symptoms have not been noticed.—*Therapeutische Monatshefte*, 1898, Heft 4, S. 177.

Oil of Salosal in Urinary Diseases.—DR. OSCAR WERLER, having ascertained that salol is soluble in Bombay oil of salosantal to 33 per cent., proposes the name given above for the combination. The dose employed is from ten to twenty drops after each meal in a tablespoonful of sweetened water. This can also be administered in gelatin capsules. Salol, according to Arnold, renders alkaline uric acid, removes the foul odor, diminishes its purulency, increases the quantity, and does not interfere with digestion. Ten instances of the use of the remedy are reported. Its advantages are that (1) it is not only antiseptic, but as well analgesic. (2) It is equally effective in alkaline as in acid urine. (3) It is diuretic. (4) It is not expensive. Its contraindications are acute and chronic nephritis, gastric indigestion, and those

who do not tolerate balsams. Its indications are (1) in affections of the urethra and bladder which are characterized by sensitiveness when injections and irrigations are not possible. (2) Acute exacerbations and complications, with painful and severe inflammatory reactions, for which antiphlogistic, antispasmodic, and sedative remedies must be applied. (3) Instances of chronic vesical catarrh with alkaline, ammoniacal urine, as well as those in which the urine is acid when an antiseptic is needed. (4) Instances of obstinate and chronic gonorrhœa when not only a parasiticide but an anti-catarrhal remedy is indicated.—*Therapeutische Monatshefte*, 1898, Heft 5, S. 266.

The Treatment of Incontinence of Urine in Children with Rhus Aromatica.—DR. LUDWIG FREYBERGER makes use of a fluid extract of the fragrant sumach of America. This was first used in the treatment of incontinence of urine caused by an atonic state of the bladder. Burvenich believed that it was a powerful tonic for the bladder, acting similarly to nux vomica. According to Numa, it stimulates the unstriated muscle of the bladder as well as that of the uterus and rectum. During the past three years one hundred and ten instances of enuresis have been under observation. Leaving out those in which the symptom was due to phimosis, preputial adhesions, hypospadias, urinary hyperacidity, cystitis, nephritis, or glycosuria, there remained altogether sixty instances of the use of this drug. Of these, thirty are tabulated, because a sufficiently long time has elapsed since their discharge (nine months to two years) to enable an opinion to be given as to a permanent cure. Patients who had previously received belladonna, strychnine, or tonics without success were at once put upon this treatment. Others underwent a preparatory treatment, which consisted of regulation of the diet, sleeping upon a hard mattress, the use of light coverings, and cold sponging along the spine. The children were taken up once or twice during the night and made to pass water. The formula is: Fluid extract of rhus aromatica, 1; aromatic syrup, 2; distilled water, 6, which conceals the astringent taste and disagreeable odor. The dose varies from five to ten minims (two to five years); ten to fifteen minims (five to ten years), with a maximum of twenty minims for older children. Of the thirty instances recorded, twelve boys and eighteen girls, cure followed in eighteen, eleven boys and seven girls; improvement in ten, one boy and nine girls; and no improvement in two girls. "Cure" is intended to mean that at least nine months have elapsed since enuresis has occurred for the last time. The average duration of treatment was thirty-four days in boys and forty-five in girls. Thirty-three days, on an average, were sufficient to produce a permanent cure, fifty-three to effect a permanent improvement. It would be rash to claim this remedy as a specific, but it certainly appears to be as efficacious as belladonna, may be given for a long time without the slightest ill effect, and good results may be obtained when the latter proves ineffective.—*Treatment*, 1898, No. 5, p. 129.

The Value of Certain Drugs in the Treatment of Gout.—DR. ARTHUR P. LUFF states that the treatment of this disease by alkalies is mainly based on the assumption that uric acid is present as such in the blood and tissues,

and is rendered soluble by the administration of alkalies, that uratic deposits of sodium biurate are dissolved by alkalies, and that the system of a gouty person is pervaded by a general acidity which is neutralized and removed by alkalies. With regard to the first assumption, it is now well known that in gouty subjects uric acid is never present as such in the blood and tissues, but is always combined with sodium as the quadriurate or biurate. The only way in which alkalies could beneficially affect the quadriurate would be to delay its conversion into the biurate. Experiments with an artificial blood-serum to which potassium carbonate, potassium citrate, lithium carbonate, lithium citrate, sodium bicarbonate, sodium phosphate, piperazine and lysidin were added in solution showed that this conversion is not delayed. The following do not in the slightest degree increase the solvent power of the blood for gouty deposits: Potassium carbonate, potassium citrate, lithium carbonate, lithium citrate, sodium phosphate, piperazine and lysidin. Sodium bicarbonate slightly decreases the solvent power of the blood for gouty deposits. The assumption that in connection with gout there is a general acidity of the system which causes a diminished alkalinity in the blood is opposed to the results of recent investigations upon the subject. Klemperer showed that the alkalinity in the blood in gout is very little, if at all, diminished, and that corresponding variations in the alkalinity of the blood may frequently be met with in healthy individuals. Moreover sodium biurate. Experiments with sodium salicylate show that it has over, a diminution of the alkalinity of blood-serum containing uric acid in does a diminution in the alkalinity of blood-serum diminish its solvent power solution does not facilitate the deposition of sodium biurate from it, nor no direct action either in delaying the decomposition of sodium quadriurate or in effecting a solvent action on deposits of sodium biurate. The supposed solvent effect of sodium salicylate for gouty deposits does not, therefore exist. The correct explanation of the increased elimination of uric acid in the urine during the administration of sodium salicylate is that salicylic acid unites readily with glycocine, and so conveys an increased amount of that body to the kidneys, where, by its combination with urea, an increased amount of uric acid is necessarily formed. This increased formation of uric acid is directly detrimental to gouty subjects, and on that account the salicylates are contraindicated in that disease. The general conclusions are that the ordinary alkalies, lithium salts, piperazine, and lysidin are useless, and sodium salicylate is also apparently contraindicated in gout.—*The Lancet*, 1898, No. 3902, p. 1606.

The Melaleuca Viridiflora.—M. DUBOUSQUET-LABORDERIE calls attention to this tree, which is found in New Caledonia, from which an essence is obtained resembling that of eucalyptus. In pulmonary tuberculosis, administered by the stomach in dose of ten capsules (each four grains) daily, it gives rise to no disturbance. An oily emulsion of 2 per cent. strength can be given hypodermatically. In this disease cough, expectoration, and fever cease and the weight increases. In coryza and tonsillitis, inhalations produce remarkable sedative effects. In diseases of the urinary apparatus excellent results have been obtained. In one instance albuminuria disappeared. In cystitis and prostatitis, irrigation with a 2 per cent. aqueous

solution is advised. For rheumatism and neuralgia local frictions are recommended. For wounds a 5 per cent. solution, for burns double this strength, produces an agreeable coolness and hastens healing.—*Revue de Thérapeutique Médico-Chirurgicale*, 1898, No. 12, p. 407.

Clinical Observations upon Kryofine.—DR. M. A. SHLENKER has employed this drug for seven patients, whose histories are reported. As an antipyretic it acts within an hour after its administration, and its effects last for at least three hours. As an analgesic it is equally good or superior to antipyrine or phenacetin, and seems to be well borne by the stomach. In hysteria and neurasthenia it gives restful sleep. The dose varies from seven to fifteen grains, but seventy-five grains have been given without producing death, although with such an amount there is marked depression.—*Atlantic Medical Weekly*, 1898, No. 20, p. 305.

Peronin.—DR. MELTZER concludes that (1) this remedy (benzyl-morphine), in dose of from two-thirds to one and one-half grains, acts similarly to morphine, but is free from any unpleasant after-effects. (2) Its place, as concerns its hypnotic action, is between morphine, on the one side, and such hypnotics as paraldehyde, amylene hydrate, sulphonal, and trional, on the other. Its disadvantages are its difficult solubility and its unpleasant taste. The first can be remedied by its mixture (not solution) as follows: Peronin, 2; saccharin, 0.5; spirit of wine, 100; and water, 900. This must be thoroughly shaken before the dose is taken from the bottle. As for the second objection, it is not more unpleasant than the above-named hypnotics.—*Therapeutische Monatshefte*, 1898, Heft 6, S. 316.

Eucaïne-B in General Surgery.—DR. GIUSEPPE CIPRIANI claims that this is not irritating to mucous membranes, nor does it produce an inconvenient hyperæmia. He employs solutions varying in strength in from 2 to 6 per cent. With these, when the operation is of short duration, he can avoid general anesthesia in persons suffering from cardiac disease.—*Therapeutische Monatshefte*, 1898, Heft 6, S. 331.

M. A. LEGRAND makes use of a 2 per cent. solution in distilled water (solution by boiling), which is stable. He concludes that: (1) It is a good local anæsthetic, about three and one-half times less toxic than cocaine, and produces as quickly as complete an anæsthesia as the latter, but of shorter duration. (2) In inflamed tissues the results are as uncertain as from cocaine. (3) It is a vaso-dilator. (4) It produces upon mucous surfaces and in wounds a disagreeable burning sensation which generally appears about twenty-five minutes after anæsthesia, and may last an hour and a half.—*Les Nouveaux Remèdes*, 1898, No. 11, p. 224.

A Clinical Study of Kryofine.—DRS. SIDNEY V. HAAS and J. BENNETT MORRISON report that this substance reduces temperature gradually, attaining its maximum effect in from three to six hours, without producing much diaphoresis. The pulse-rate is also reduced with the temperature, and there is practically no depression. Of the one hundred and fifty instances of its use only two showed cyanosis or collapse. As an analgesic it relieves head-

ache and is very effectual in neuritis. In the malaise of acute febrile conditions and to produce sleep in simple insomnia it has been beneficial. The usual dose is about seven grains; the maximum amount which has been given in twenty-four hours is a drachm. Since it is sparingly soluble it should be administered in substance, or as tablets, wafers, or capsules.—*New York Medical Journal*, 1898, No. 1008, p. 425.

Dry Calcium Sulphohydrate as a Depilatory.—DR. ALEMBERT W. BRAYTON states that calcium sulphohydrate can be made by heating a granulated mixture of plaster of Paris (calcium sulphate) with granulated wood-charcoal (to take off the oxygen). A high temperature is necessary, and it is best obtained by means of gas. A muffler is used—*i. e.*, set in cinders or bone-ash, and the mixture is heated to redness. By this method neither sulphuric acid nor iron sulphide is used. The dry, rose-colored or whitish product is applied to the skin in a wetted condition, or it may be put on dry and then wetted. Hydrogen sulphide is given off, which causes a rather foul smell. The substance is perfectly harmless to the skin, and may be left on any length of time, and does not even irritate abraded surfaces. It can be made cheaply.—*Journal of the American Medical Association*, 1898, No. 16, p. 921.

The Treatment of Latent Dyspepsia.—M. ALBERT ROBIN states that if the stomach does not perform its work this failure can be completely supplied by the intestine. Reference is made to the total ablation of the stomach of a dog by Frémont. If the conclusion is reached that the stomach is not indispensable, it does not follow that latent dyspepsia is not without its inconveniences. If, however, the intestine fails, then the symptoms of dyspepsia appear and dominate the scene. To obtain a cure the constipation must be relieved, and for this these measures should be employed: (1) Purgatives, particularly drastic purgatives in small doses, for these are not followed by constipation as are the salines, which necessitates their continued use. (2) Gentle and methodical massage of the large intestine, and (3) the use of mineral waters, as Châtelguyon, Brides, Aulus, Kissingen, and Carlsbad. Albuminuria of dyspeptic origin is frequent, there also exists a dyspeptic diabetes, and these require treatment which is not usually considered in the discussions upon the therapy of these conditions.—*Le Progrès Médical*, 1898, No. 12, p. 182.

Infiltration Anæsthesia.—DR. CARL LUDWIG SCHLEICH, after recounting his experiments, states that the technical process is always the same: the formation, by means of the three solutions bearing his name, of an artificial œdema of the whole area within which an operation is to take place. The entire surface must be saturated in order that the operation may be completed without further injections. The needle is inserted its whole length horizontally so that it does not penetrate into the fatty tissues, and the contents of the syringe forced out by drops as the needle is gradually withdrawn. The subcutaneous tissues are next anæsthetized by expelling the fluid as the needle advances down to the limit which the operator is expected to reach. The strengths of the solutions are as follows: Cocaine hydrochlorate, 0.2

(strong), 0.1 (medium), 0.01 (weak); morphine, 0.025 (strong and medium), 0.005 (weak): sterilized sodium chloride, 0.2; distilled water to 100.0.—*Pediatrics*, 1898, No. 8, p. 335.

[Evidently the morphine has some effect in producing anæsthesia. Further than this the observations of Halsted, which showed that pure water, when injected hypodermatically, produced anæsthesia, have not been considered.—R. W. W.]

Eucaine-B.—M. RECLUS sums up the advantages of this over other local anæsthetics as follows: (1) Its solutions can be heated even to boiling. This permits sterilization by heat. (2) Its solutions are stable and permanent, and (3) it is much less toxic (1 to 3.75) than cocaine. As for cocaine, the author employs a 1 per cent. solution, but with the precaution that the patient shall remain in a horizontal position for an hour or two after the operation, to avoid vertigo, tendency to syncope, pains in the stomach, and vomiting. This precaution is unnecessary when the former is employed, and, therefore, it is to be preferred when the patient is to walk immediately after the operation. If the field of operation is large or a considerable quantity of the anæsthetic is required, the safer should be chosen.—*Le Bulletin Médical*, 1898, No. 26, p. 300.

Treatment of Gonorrhœa.—DR. BEHREND reports that of twelve instances of this disease in males (first attack), after one or two days the gonococci disappeared under the use of $\frac{1}{2}$ to 1 per cent. solutions of protargol. Upon the clinical symptoms this remedy had no influence; the discharge continued. Better results were obtained by the use of other astringents, as the alum injection, although the latter does not destroy the gonococci. He treats the disease, while the followers of Neisser treat only the gonococci. The disadvantage of protargol lies in the fact that it acts only on the gonococci which it can reach; those which it cannot it leaves in peace, for it does not penetrate into the tissues.

This provoked a vigorous reply from Frank and Meissner, the former basing his argument upon five months' use of the remedy (133 patients), and quoting Fenger (110 patients), who had lauded the new remedy.—*Klinisch-therapeutische Wochenschrift*, 1898, No. 12, S. 414.

Yellow Palms as a Sign of Typhoid Fever.—FILOPOWICZ (*Centralblatt für die med. Wiss.*, 1898, No. 11) calls attention [for the second time] to a symptom of typhoid fever not generally looked for. The palms and soles acquire a yellow color, which is more marked in proportion as the skin is thickened by toil, but present even when the skin is thin. This change comes on in the early days of the disease, and lasts until the end, disappearing in convalescence. The author thinks the sign due to the changes in the circulation, especially to anæmia of the skin, as the result of which the subcutaneous fat shows through.

Recent Improvements in the Treatment of Chronic Heart-diseases by Exercises and Carbonated Brine Baths.—DR. THOMAS E. SATTERTHWAITE presents a valuable paper. He makes use of the resisted movements almost

exclusively, meaning that the patient makes regular voluntary movements, which are resisted by the physician or operator. These movements are fully illustrated by a series of thirty-seven plates. For the baths, which must be given in wooden or porcelain tubs, ordinary American sea-salt is preferred, because benefit is obtained from the iodides and bromides which it contains. To each pound of this, one and one-half ounces of calcium chloride are added. The carbon dioxide gas, which is added after two or three baths have been taken, is obtained from the action of sodium bisulphate, commonly known as the acid sulphate, upon sodium bicarbonate, such a quantity being employed that $\frac{1}{4}$ to 1 per cent. gas solution is obtained. The duration of the immersion is from four to twenty minutes, but no longer. The temperature should not exceed 95°, nor go below 85°; indeed, rarely below 90° F. At first the baths are given with an intermission every second day, then every third, later every fourth day, and still later every fifth day. The course of baths lasts from four to six weeks. After the bath the patient should be rubbed dry with towels, remain indoors, and rest for an hour at least.—*The Post-Graduate*, 1898, No. 6, p. 437.

[We recommend the perusal of this paper in its entirety. The author has given the essentials freed from the superfluous details, which have been added for various reasons, and has avoided the extravagances of the earlier writers.—R. W. W.]

MEDICINE.

UNDER THE CHARGE OF

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The Length of the Incubation Stage in Typhoid Fever.—E. JANCKEN (*Wiener klinische Wochenschrift*, 1898, No. 27) had an opportunity of making an important observation. Certain troops marching through two small villages in which were a number of cases of typhoid fever, drank copiously of water given by the villagers. That infection was acquired in this way follows from the absence of other exposure. Moreover, other troops passing through without pausing to drink remained free from infection. Of the thirty-six cases the symptoms appeared suddenly in all, with headache, chill, fever, severe diarrhœa, abdominal pain, and weakness. The course was mild, and defervescence occurred in the third week. The beginning of the disease was noted in three men on the second day (*i. e.*, two days after infection), in seven on the third day, in six on the fourth, four on the sixth, five on the seventh, in the other seven between the ninth and fourteenth days. This shows that under favorable conditions the typhoid bacilli can

produce symptoms within two days. In the cases observed the favorable conditions consisted in great fatigue, excessive thirst, and the ingestion of considerable quantities of the infected water. That the germs were not of unusually great virulence may be supposed from the mild form of the disease.

The Diazo-reaction.—KROKIEWICZ (*Wiener klinische Wochenschrift*, 1898, No. 29) has made an extensive series of observations (more than sixteen thousand tests in eleven hundred cases) on this test, covering a great variety of diseases. Of many of the results it is not necessary to speak here. Suffice it to say that in most diseases examined the reaction was rarely or never present. An interesting result was that in kidney disease (except in the case of chrysarobin poisoning) the test was never employed. Even in cases of tuberculosis, with chronic nephritis or amyloid disease, the reaction was absent. In malaria the reaction was sometimes obtained in the acute febrile stage; in the chill it was always absent. The author found that the diazo-reaction occurring in pulmonary tuberculosis indicates a bad prognosis. The reaction is sometimes present before bacilli can be detected. Cases in which the reaction occurred with slight lesions ran a rapidly fatal course. Gangrene of the lungs in the course of tuberculosis seems to prevent the reaction. In tuberculosis of the mucous membranes, the lymph glands, the motor and genito-urinary tracts, the reaction is often absent altogether or in part of the course. In miliary tuberculosis the reaction is always present, but may become less intense just before death. In typhoid fever, even in abortive cases, the reaction is always present in the first and second stages. Later it becomes less intense or is absent. The reaction in this disease may be looked on as a symptom, and so long as it is present the disease cannot be considered as subsiding, even if the course at the time seems favorable. The reappearance of the test in convalescence almost always indicates a relapse. In cases of doubt between cancer of the stomach and intestinal tuberculosis the constant absence of the reaction points to cancer. The author made experiments with the toxins of tuberculosis, typhoid, erysipelas, and pus, with negative results, and is inclined to ascribe the reaction to unknown products of cell metabolism.

A Crural Venous Murmur.—RICHARD GEIGEL (*Münchener med. Wochenschrift*, 1898, No. 27) notes an observation that has an important bearing on the double murmur (Duroziez's) heard over the femoral artery in aortic regurgitation. (Geigel also finds the double murmur not rarely in chlorosis, and as a rule with the *pulsus celer*). According to him, if the stethoscope is pressed about ten seconds hard enough to cause a systolic murmur over the femoral artery, and then the pressure suddenly released, a murmur can be heard, long or short, blowing or even musical. It sometimes lasts several seconds. On account of the duration he claims the murmur is venous; moreover, when short it is not synchronous with the arterial diastolic murmur still audible with light pressure. So a double arterial murmur may be supposed to be present if the facts here described are not known, since the method of bringing out Duroziez's sign is similar to that mentioned. Geigel, whose studies of physical signs are always noteworthy, explains the murmur in the vein as follows: The pressure of the stethoscope on the

vessels hinders the flow of blood out of the crural vein and raises its pressure. When the pressure is relieved the blood flows with increased rapidity into the iliac vein. If the crural vein is still partly compressed a stenotic murmur will be produced, and this lasts until the pressure is equalized. The murmur will also be assisted by low pressure in the iliac vein, resulting from the partial obstruction of the crural.

The murmur described occurs in many individuals, sick and well, its inconstancy being, perhaps, due to variations in the position of the vein.

Two Rare Cases of Auto-intoxication.—G. ROSENFELD (*Centralblatt für inner Med.*, 1898, No. 29) reports two cases of diagnostic importance. A woman, aged thirty-two years, had vomited everything swallowed for thirteen days, and during that time had only two stools. At the end of this time she was partly stuporous, the lips fuliginous, tongue dry and fissured. Loud commands were followed by rolling of the eyes. The pupils were contracted, but the reaction was preserved. There was continued frontal headache; no fever. Examination of the body was negative; the spleen was not enlarged. There was the odor of acetone on the breath; the urine, reduced slightly, contained much acetone and diacetic acid; no albumin; diazo-reaction negative. The next day the acetone reaction was just as strong as before; the polariscope showed a deviation to the right of less than one degree; the phenylhydrazin test gave a copious sediment of osazone. The mind was clearer. Recovery gradually followed.

A man, aged twenty-six years, had anorexia and vomiting for two weeks. At the examination he vomited a test-breakfast after forty minutes, the vomitus containing no free HCl. The urine, reduced slightly, contained much acetone, diacetic acid, and osazone; no albumin. After four days the acetone disappeared, but the osazone, which resembled galactosazone, continued. After a test-breakfast HCl was present in excess. One hundred grammes of glucose were taken without causing an increase in the reducing power of the urine. The patient recovered, though with hydrochloric acid still in excess in the gastric juice. Neither patient had diabetes, and the attacks can hardly be looked on as other than intestinal auto-intoxications. The author leaves undecided the question whether the acetone was the toxic agent or only the associate of an unknown intestinal toxin. The treatment consisted in feeding by cream (one liter a day) and ice-cream.

The Bacterial Complications of Diabetes.—HONL (*Wiener klin. Rundschau*, 1898, No. 16) shows that diabetics are so prone to bacterial invasions because: The glucose has a favorable effect on bacterial growth; the sugar lowers the resistance of the tissues; the diabetic cachexia and the lessened alkalinity of the blood assist. As the result of examinations in twenty-nine cases he found that the most frequent complication was tuberculosis (41 per cent.). Diabetic tuberculosis appears in various forms, one of which is remarkable for the rapid destruction of lung tissue and the sparse appearance of specific bacilli, and is due to bacterial symbiosis. From the tuberculous cavities septic or pyæmic processes may arise, some of which are due to bacteria rare in human pathology. A case of pneumo-bacillary septicopyæmia is detailed, being the fourth so far reported.

The Left Ventricle in Mitral Disease.—OESTREICH (*Archiv für path. Anat.*, Band cli., p. 189) has made some observations that help to clear up the opposing views of Lenhartz and Baumbach, who denied that mitral stenosis caused atrophy of the left ventricle, and Dunbar, who tried to show that the old view was correct. Oestreich finds that Dunbar and the older authors were wrong. The error probably arose through the hypertrophy of the right ventricle, in comparison with which the normal left ventricle seemed atrophied. Atrophy does not really occur, and a sufficient filling of the ventricle seems probable by reason of the increase of pressure and rapidity of the blood-flow. In mitral insufficiency the author found that hypertrophy was not always present, but when so is due to local anatomical changes, especially those causing retraction, increasing the work of the ventricle.

Papillary Myxoma of the Tricuspid Valve.—GUTH (*Prager med. Wochenschrift*, 1898, No. 8) reports a case of this kind in the body of a patient with medullary cancer of the stomach, perforation of the stomach and diaphragm, and septic pleurisy. The tumor was on the auricular side of the posterior flap of the tricuspid valve, about the size of a bean; villous; grayish red. The tissue was myxomatous, growing from the connective tissue of the flap and covered with endothelium. The author thinks it had no relation with endocarditis. Altogether, sixteen cases of myxoma of the heart have been described, three of them being papillary.

Dulness Over the Apices of the Lungs, without Pathological Changes.—KERNIG (*Zeitschrift für klin. Med.*, Bd. xxxiv. p. 322) calls attention to this condition, which is not clearly enough described in text-books. The cases are not frequent. They affect weak, cachectic, bed-ridden patients. The dulness is found in the supra- and infraclavicular and suprascapular regions. It is usually as marked as in cases of retraction or tuberculous infiltration. The breathing in the affected areas is usually more or less weak; at all events there are no râles and no bronchial breathing. On account of the almost constant emaciation and weakness of the patients, inspection, palpation, and the changes in respiration are comparatively useless. This phenomenon the author ascribes to a retraction of the lung tissue, caused by imperfect inspiration, but a senile atrophy is perhaps often present, as in one case under his observation.

Pericarditic Pseudo-cirrhosis of the Liver.—Although the accuracy of the clinical picture of this disease given by PICK (see *THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES*, August, 1896) has been confirmed by various observers, the explanation of the ascites, given by him, has been denied by some. So Heidmann thinks the ascites is due to peritonitis, although the probability of this view was early denied by Pick. NACHOD (*Prager med. Wochenschrift*, 1898, No. 26) was able to throw an important light on the question by reason of a laparotomy made on a patient in the early stage of the disease. The symptoms began with pain and swelling in the joints, following cold. Later, dyspnoea, palpitation, headache, and dizziness appeared. Oedema of the feet was followed by ascites, and the

oedema then subsided. The heart was enlarged in all directions, the apex beat feeble, the first sound at the apex impure, the second sound at the base double, the second pulmonary accentuated. The liver was enlarged; there was ascites; the splenic dulness enlarged. No albuminuria. An exact diagnosis was not made; the heart was looked on as the organ first affected. After two months the ascites had increased so much that some operative treatment was necessary, and laparotomy was performed. An incision was made from umbilicus to symphysis. The peritoneum was perfectly healthy; there were no adhesions. Five litres of yellow fluid were evacuated. The liver was enlarged, extending a hand's-breadth beyond the ribs; the edge was thickened, smooth, hard, and cyanotic. The spleen felt normal. Improvement was only temporary. Puncture was necessary five times, and nine months after operation the patient died. Autopsy showed tuberculosis of the serous membranes; fibrinous pericarditis, with extensive adhesions; cardiac cirrhosis of the liver. Had it not been for the laparotomy it might have been thought the case was one of serous membrane tuberculosis from the beginning, and, in fact, the description of the alterations is not sufficiently clear to enable the reader to exclude a tuberculous origin for the whole case. The author, however, holds a different opinion, although he admits the impossibility of explaining why it is that pericardial adhesions are followed in some cases by the changes found. Still, as Pick pointed out, other diseases of the heart show a great irregularity in the associated changes.

SURGERY.

UNDER THE CHARGE OF

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Surgical Intervention in Hæmatemesis Consecutive to Exulceration of the Stomach.—DIEULAFOY (*La Press Méd.*, January 19, 1898) summarizes his views on this subject as follows :

1. Outside of the simple ulcer, which is a frequent cause of hæmatemesis there is found a superficial loss of substance of quite large extent, which the author proposes to term simple exulceration.
2. This form of ulceration the author believes is capable of producing a more terrible form of hemorrhage than that generally seen in the case of simple ulcers.
3. The loss of substance in simple exulceration does not go deeper than

the mucous layer; it takes in the muscularis mucosæ, however. The great and frequently deadly hemorrhage which results arises from the ulceration of one of the arteries which ramify in the muscularis mucosæ.

4. Clinically, the simple exulceration has the symptomatology of the simple ulcer as described by Cruveilhier, of which it no doubt is the initial stage; but more frequently it commences quietly and at the same time in a latent manner with moderately severe hemorrhages.

5. Surgical intervention is the preferable treatment for hemorrhages consecutive to simple exulceration. The abundance rather than the repetition of the hemorrhage is the indication for intervention.

6. The operator should never forget that the stomach may present an apparently sound appearance and yet be the seat in some part of a simple exulceration. It is therefore essential carefully to examine the entire stomach, if necessary, with a lens, to detect the exulceration, which is frequently accompanied by ecchymotic areas which are points of repair.

7. Suture of the area involved with a small margin of sound tissue usually suffices in these cases. The operative results are generally more successful in this form of ulceration than in the case of simple ulcers, as the limitation of the lesion favors the surgical method of treatment.

A New Typical Form of Acute Intestinal Obstruction.—An interesting series of five cases of intestinal obstruction are reported by HOCHENEGB (Wiener klin. Wochenschrift, December 23, 1897) which demonstrate a new typical form of intestinal obstruction which he has named "combination-sileus."

In all the cases it was noted that a stenosis of the colon had existed for some time, producing an hypertrophy of the walls of the gut. Besides this lesion, all the patients suffered from an acute intercurrent obstruction of the small intestine, either by bands, contracting scar-tissue, or herniæ, the acute activity of which was produced by the drawing back of the intestinal contents, in the first place, by the obstruction in the large intestine. The intestine is distended between these points of stenosis and above them, and is marked by increased peristalsis. If the operation is undertaken at this stage only the obstruction in the colon would be detected.

The chronic condition present in the colon would cause an hypertrophy of its walls, and there would be greater force in its peristalsis, which would be more effectual than that of the small intestine, and in consequence the retrograde peristalsis from the colon would finally force all its contents above the seat of stricture in the small intestine.

An operation undertaken at this time would undoubtedly remove only the obstruction in the small intestine, while the primary cause of the trouble would go undetected. This occurred in all the author's cases. At first there was apparent improvement, the patient gaining for a few days, when suddenly the symptoms of obstruction returned, with all their former severity, the subsequent operation alone demonstrating the true condition. Since the former operation and the patient's subsequent condition have so altered the force of the peristaltic movements in the colon that they are scarcely visible, the condition is difficult to differentiate from peritonitis.

Such a condition is a very serious one for an operator to face who believes

that he has already removed all cause of obstruction, and it has probably frequently happened that patients have died because the possibility of such a complication was not thought of. The long interval between the relapses which some of the cases showed was possibly due to a temporary subsidence of the œdema present at the primary point of obstruction, caused by the rest and treatment of the secondary lesion. The occurrence of five cases in fifty-two operations performed by the author for intestinal obstruction shows that the condition is not so rare as might be supposed.

The diagnosis is materially assisted by considering the patient's statements as to where he first experienced pain and what the locality was in which the obstruction seemed to him to be situated. More certain is the observation in the early stages of peristaltic movements in the distended colon and the subsequent change in the location of the symptoms. The change is generally one from a condition in which therapeutic measures might be considered to one in which only immediate operative interference can be considered.

The symptom at the time of operation which will lead to the detection of such a condition, when it is suspected, is the contrast between the two portions of the colon. Above it is hypertrophied from the continued action required in overcoming the chronic condition prior to the complete obstruction, while below in the descending colon the intestinal wall is of normal thickness.

The Operation of Gastro-enterostomy Conjoined with Entero-anastomosis.—In discussing the present status of this operation, WEIR (*Medical Record*, April 16, 1898) summarizes his views on the subject in the following conclusions :

1. That gastro-enterostomy, as usually performed, is yet an unsatisfactory operation.
2. That its principal relievable danger is from bile or stomach retention due to operative defects, either primary or secondary—*e. g.*, spurs, kinks, twisted or distorted openings, and possibly stomach atony.
3. That a posterior stomach opening favors gravity action by the evacuation of the organ, particularly if it is atonied, and diminishes the risk of pressure or of pulling on the attached intestine.
4. That the operation is best conducted by means of the Murphy-button.
5. That a gastro-enterostomy, associated with an entero-anastomosis in the afferent and efferent portions of the jejunum, probably gives the best assurance against obstruction. Experience in this method, while so far gratifying, should, however, be enlarged to ascertain if the increased risk of the additional button overtops the danger of the bile and pancreatic obstruction.

A Simple Method for Controlling Hemorrhage During Disarticulation at the Hip.—THOMAS (*Lancet*, April 23, 1898) details a simple method for controlling hemorrhage from the femoral artery which he used with satisfaction in an amputation at the hip.

The common femoral artery and vein were temporarily compressed immediately below Poupart's ligament. At this point the artery is quite super-

ficial and easily felt, and is well above the origin of the deep femoral. The femoral pulse being felt, he made a stab-puncture in the skin, one about an inch outside the pulse, and the other about two inches to its inner side—i. e., immediately below the pubic spine. An aneurism needle was pushed from one stab-puncture well behind the artery and vein to the other stab-puncture, and two long, thick, silk ligatures were carried back when it was withdrawn. A roll of compressible material was placed over the artery and the two ligatures tied separately over it, after the limb had been elevated for a sufficient length of time to empty it of blood. The knots are not firmly fastened at first, a surgeon's knot is used, held by hæmostats, so that they can be readily made tighter if it is found necessary.

The same result can be attained by making one puncture and pushing one blade of a Doyen's broad ligament forceps beneath the vessels, and then clamping them, but this requires an extra instrument and is not available in an emergency.

The Abdominal Incision Through the Sheath of the Rectus Muscle, with the Displacement of its Lateral or Median Margin.—LENNANDER (*Centralblatt für Chirurgie*, 1898, No. 4) has used this incision in many cases of appendicitis, and believes it is preferable except where firm adhesions hold the appendix in the lumbar region or in the lateral portion of the iliac fossa and where drainage is necessary. It is especially useful in operations during the interval, where the exact position of the appendix can usually be determined beforehand. In all cases where the cæcum and appendix are freely movable this incision gives better results and allows in women the thorough exploration of the adnexa, which are also frequently involved.

The direct incision through the rectus muscle has the disadvantages of cutting the vasa epigastrica inferiora, of generally cutting the muscular branches of the nerves and producing atrophy, and in addition the scars of the incision directly through the different layers of the abdomen are in close relation to each other.

The method the author advocates is through the skin, then through the anterior fibres of the sheath of the rectus one-half to three-quarters of an inch from the external margin of the muscle and toward the median line.

On the right side, if for appendicitis. The wound is thoroughly dried, the border of the rectus carefully freed and gently displaced inward. One or two nerves accompanied by vessels are seen now crossing the field diagonally to the muscle. The vessels are tied and cut. In almost all operations the nerves can be displaced to the upper or lower angle of the wound and remain unharmed throughout the operation. The posterior layer of the rectus sheath is now incised, and with it the peritoneum opposite the skin incision.

The wound is afterward closed by layers of sutures separate from the peritoneum and posterior layer of the sheath; the muscle is then replaced, its margin attached by sutures, the anterior layer of the sheath sutured separately. The skin is closed with deep and superficial sutures of silkworm-gut, the deep sutures including the sheath of the rectus. Drainage or even packing may be employed in the area anterior to the rectus sheath, if deemed necessary.

The advantages of this method are the great extent of the scar or wound surface, the possibility in simple operations of avoiding the nerves, presence between the two incisions in the rectus sheath of a living muscle that is entirely intact, and that the incision is made through an area well supplied by bloodvessels, which is not the case in incisions in the linea alba or semilunaris.

The same method may be applied to all abdominal incisions in the median line by making the incision through the sheath just outside the median border of the rectus muscle.

After a large number of operations by this method, the author is perfectly satisfied with his results, and has seen no tendency to hernia.

The Anatomy and Treatment of Flat-foot.—Long, narrow feet are, according to CLARKE (*Lancet*, April 23, 1898), the most likely to become flattened from pressure on the highest part of the arches, so that in extreme cases the whole of the inner border of the foot rests upon the ground.

The treatment adopted by the author consists in wearing boots properly shaped—*i. e.*, having soles that are sufficiently wide anteriorly for the toes. They are furnished with pads of vulcanized rubber, so formed that the highest part falls in front of the transverse tarsal joints. In addition, an outside leg-iron, jointed at the ankle and supported by an inside T-strap, is applied in some cases. Manual wrenchings and douchings are also helpful, and as soon as sufficient improvement has been obtained suitable exercises may be begun. These exercises are useful, and in suitable cases may alone suffice. (1) Rising on tip-toe a definite number of times, the toes being inclined inward. (2) Adduction of the foot, repeated several times. (3) Walking for a short time daily on the outer border of the foot.

Another form of flat-foot that often demands complete rest for a time is that observed in active rickets. Every case requires its own management of complications, of which hallux valgus and hammer-toe are the commonest. To correct these deformities the author employs a metal sole of proper shape, with a toe-post to hold the great toe in position and slots for the insertion of a soft bandage which holds the other toes in their proper position.

Tibio-tarsal Disarticulation with a Flap Containing the Periosteum of the Calcaneum.—The results obtained from this method of amputation, which were first described by Ollier, have lately been studied by LA BOMEARDIÈRE (*Revue de Chirurgie*, September, 1897) by means of skiagraphs which show that there results a reproduction of bone from the periosteal flap of the calcaneum which varies in its opacity to the Röntgen ray in proportion to the length of time it has been formed. In all its states it, however, formed a firm support for the weight of the body, the amount of new bone depending to a great extent upon the age of the calcaneum removed. The cicatrix is entirely anterior, and is not subject to pressure.

The functional result is excellent, shortening is reduced to a minimum, walking is easy, and the deformity produced is readily hidden by an appropriate apparatus.

There are many marks of superiority over other older methods; there is less traumatism; there is absolute security from an operative stand-point

for the preservation of the posterior tibial artery and its branches. The point of pressure is over that part of the foot which normally supports the greatest pressure. It unites all the advantages of Pirogoff's amputation without the disadvantages which are met in tubercular disease of the bones.

It is preferable to other operations in all cases of tubercular disease of the tarsus, especially the posterior portion. It is only contraindicated by malignant disease of the bones. In cases of traumatic injury Pirogoff's amputation should be employed, or some of its modifications, with the idea of saving all that is possible. This is true where the tubercular lesion is diffuse and recurrence is to be expected, where less radical measures are pursued, or where a rapid healing with a useful limb is the object desired.

The Surgical Treatment of Local Manifestations of Filarial Disease.

—CRAWFORD (*Indian Medical Gazette*, April, 1898) illustrates an article on this subject by the report of two interesting cases of filarial disease which show the beneficial effect of surgical interference in these cases. The question of operation resolves itself into the treatment of the different local troubles and inconveniences arising from the blocking of the lymphatic system in different parts of the body. Many of these local lesions are subjected to operation with very decided success, so much so that there is neither doubt nor hesitation on the surgeon's part, provided the general condition is satisfactory—the ordinary limitations, in fact, attending all surgical procedures undertaken where life itself is not in the balance. The presence of parasites in other parts of the body is no contraindication to operation.

The dilatations in the lymphatics usually occur in the neighborhood of glands, and on careful dissection enlarged lymph-vessels may be seen passing into and out of them. The groin is commonly affected, both femoral and inguinal regions participating in the trouble, and frequently on both sides. It is probable that there is in some cases other deeper lymphatic involvement. The removal of glands might seem but a temporary relief, but the results obtained prove its value beyond doubt.

The wounds caused by complete removal of filarial glandular enlargements and lymphangiectasis have been considered always as in no way differing from ordinary surgical wounds. Careful dissection is required, but the area involved is usually small, and ordinary surgical rules have always been applied successfully.

Amputation of the Head of the Femur as a Substitute for Exarticulation.

—FRANKE (*Centralblatt für Chirurgie*, November 13, 1897) advocates the resection of the neck of the femur, leaving the head *in situ*, as a method of saving much time in amputations of the hip-joint, both in the performance of the operation and in the subsequent healing.

The section of the neck of the femur with a chisel is much more rapidly performed than disarticulation, with the cutting of the ligaments, of the posterior portion of the joint capsule, and the removal of the head of the bone from the acetabulum. The method is not advocated for cases in which the amputation is done for malignant disease, where the leaving of the head might be followed by secondary development of the disease. The author

does, however, claim that it materially shortens the operation, and that healing is more rapidly effected where the acetabulum is filled by the living head of the femur, its nourishment being maintained by arteries found in the ligament and capsule.

The Treatment of Chronic Empyema.—The conclusions arrived at by CURTIS (*Medical Record*, March 19, 1898) are emphasized by him as follows :

We must not allow ourselves to be alarmed at the apparent severity of the operation advised, for the records show that even these weak patients bear very well the complete resection of the ribs, if it is rapidly and skilfully done. The secret of success lies in the slight anæsthesia required and in the proper control of hemorrhage.

Nor should the fear of deformity prevent these operations, for the deformity greatly diminishes with time in both adults and children.

Finally, when we consider the incurable and dangerous condition for which the operations are required, we are willing to assert that the immediate risk to life arising from the operation is justified, and that even a permanent deformity is not too great a price to pay for a cure in these desperate cases.

Inguino-scrotal and Intra-abdominal Lymphangioma; Lymphatic Varicocele, with Hydrocele Containing Filaria; Testicular Elephantiasis.—The study of an interesting series of six rare cases of lymphatic disease of the testicle, scrotum, and inguinal region leads LE DENTU (*Rev. de Chir.*, January 10, 1898) to classify these conditions as follows :

In the series of cases there were the acute, subacute, and frankly chronic varieties. The acute cases are marked by rapid invasion and intense pain, the pain being less intense when the onset is less rapid, swelling of the epididymis and frequently of the testicle itself, thickening in the tunica vaginalis, redness of the integuments in certain cases, irradiation in frequent crises of the pain along the inguinal canal, the line of the ureter (the nephritic form of Audain), vomiting more or less frequent, a fever habitually intense, remittent, and lasting three, four, or five days ; this is the symptomatology of the disease variously termed special orchitis of warm climates, malarial orchitis or filarian orchitis. These crises are frequent after their first appearance, but frequently become less acute.

In contrast to the clearly acute cases there have been sometimes observed a swelling of the testicle practically without exacerbations, but with a continuous pain. This condition of subacute, constant pain may, on the other hand, succeed formerly acute crises.

The third group are marked by the chronicity of the lesion from the onset, by the absence of pain, by the coexistence in some cases of involvement of the testicle with elephantiasis of the scrotum. It is in this category that those cases belong which the author has demonstrated are true elephantiasis of the testicle and epididymis, and in which lesions are found that coincide exactly with those of cutaneous elephantiasis. This testicular elephantiasis is preceded by attacks of acute lymphangitis or by chronic lymphangitis commencing on the surface, or in the thickness of the tunica vaginalis, or the tunica albuginea, in the epididymis or in the deferent canal itself.

In one of the cases operated upon by the author a lymphangioma was

found occupying the inguino-scrotal region and extending into the abdomen externally to the peritoneum, while there was present at the same time an incomplete inguinal hernia and a lymphatic varicocele; the latter was entirely separate from the lymphangioma and had no connection with it.

The cause of these lymphatic growths does not appear to be clear. Histologically they are alike, and yet in some the filaria sanguinis is found, as in one instance where it was seen of large size in the fluid of a hydrocele. Although it has been proven to be a cause of elephantiasis, and was found in the author's case of elephantiasis of the scrotum and testicle, the filaria is not always found in connection with these lymphangiomata.

There are two theories which seem tenable, the one attributing them to filarial infection independently of all climatic element; the other, in which climatic influences prepare the lymphatics for the subsequent growth and development of the filaria. The *elephantiasis nostras* proves that the filaria are not indispensable to the development of lymphatic disease. There are therefore other causes than the filaria capable of producing lymphatic engorgement and disorders of this system, and it is probable that the cause is complex in its nature, and that, for the present, further developments must be awaited before their etiology can be definitely settled.

The treatment of this condition is preferably a change of climate, which generally effects the death of the parent filaria and of the successive stages of the embryo.

The Employment of the Murphy-button in Place of Sutures in the Intestines.—FRANK (*Wien. klin. Woch.*, 1897, No. 39) has employed the Murphy-button with success in seven cases, including gastro-enterostomy, resection of the small intestine and of the cæcum, and in entero-anastomosis.

The results in all these operations were entirely satisfactory. The author praises the exact coaptation produced by the button, and believes it is better even than that produced by stitches, especially in the union of intestines of different calibre or in which the walls are of varying thickness. He has seen no difficulty arise from the smallness of the lumen in the button, and believes that the fecal fistula that followed in one instance was due to the excessive stretching of the intestine and not to the button, and that it would have followed suture. In one case, where entero-anastomosis was employed after a gangrenous hernia, he found that the opening into the abdomen had to be enlarged to permit the return of the intestine containing the button.

The great rapidity with which the button can be employed makes its use in cases requiring rapid operation essential, and the author is of the opinion that its use is indicated as clearly in all other operations, and that, until something better is found to take its place, it will gradually grow in deserved favor, the objections raised to it being shown to be without true foundation.

The Surgical Treatment of the Movable Liver.—TERRIER and AUVRAY (*Rev. de Chir.*, September 10, 1897), in summarizing the results of their exhaustive study of this subject, say that in the eleven cases in which it has been employed there have been eight successes, one death, and two cases in which the results of the operation are as yet uncertain.

The death was due to acute peritonitis, making it impossible to draw any

conclusion regarding the therapeutic value of the operative interference. In the eight cases the immediate and late results were so satisfactory that they are virtually cures. In all of these cases it was not possible to completely reduce the liver to an absolutely normal position, but in each it was fixed in as nearly the normal position as possible. From this fact the author concludes that the fixation produces more beneficial results than the reposition, and that, in fact, the resulting benefit is due to the fixation.

In one of the two cases in which no benefit resulted a subsequent nephropexy relieved all the symptoms, showing that the trouble had been entirely there and not with the liver.

In regard to the method of operating, the author says that the fixation of the liver is possible without great difficulty; it is a perfectly logical operation, and should be employed where certain definite indications are present, and is entirely justified by the results which have been obtained.

This operation should not be employed in the early stages of the disease where it is possible to secure a recovery by judicious internal treatment directed to the condition of the nutrition of the parts, together with the employment of a carefully-applied bandage. It should be employed in the later stages, when the draggings and compressions, which accompany the condition and produce the pain and disability of the patient, are so marked as to make recovery impossible without surgical interference.

The fixation should be accompanied by operation upon the abdominal wall, correcting the relaxed condition which predisposes to hepatoptosis.

OTOLOGY.

UNDER THE CHARGE OF

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Congenital Malformation of the Auricle.—Operations for the cosmetic improvement of congenital malformations of the auricle do not seem to be attended with encouraging results, judging from a case, with illustrations, reported by H. HECHT.—*Archiv f. Ohrenheilk.*, February 24, 1898.

Faucial, Nasal, and Aural Diphtheria.—A case of faucial, nasal, and aural diphtheria in a child, aged three years, is reported by C. H. BURNETT (*Philadelphia Polyclinic*, May 21, 1898), in which auto-reinfection of the fauces took place from the ear, which continued to run after the first attack of faucial diphtheria, and in which the diphtheria bacilli were found after recovery from the second faucial attack. The ear lost all symptoms of disease under the instillation of formalin solution (1 : 1000).

Pneumo-massage of the Ear in Chronic Aural Catarrh.—Pneumo-massage possesses great advantages over all forms of inflation in the treatment of chronic catarrhal deafness, as shown by A. POLITZER (*Ann. des Mal. de l'Oreille*, April, 1898), and by E. FRIEDLAENDER (*Berlin. klin. Wochenschrift*,

March 21, 1898). The latter maintains that it arrests the progress of the disease. Politzer employs by preference the graduated masseur of Delstanche, while Friedlaender prefers the "vibro-masseur" of Wegener.

[The simpler the apparatus for pneumo-massage the better. We have found the simple pneumatic speculum of Siegle amply sufficient for efficient pneumo-massage of the ear.—ED.]

Total Excision of the Membrana Tympani in Chronic Aural Catarrh.—

Total excision of the membrana tympani and ossicula, including the stapes, is of no value in either improvement of hearing or arrest of progressive deafness, as may be learned from articles by E. J. MOURE (*Archiv f. Ohrenh.*, April 26, 1898), E. S. CLARK (*Pacific Medical Journal*, July, 1897), and others.

[The suggestion to perform this operation or any operation on the drum cavity in chronic catarrhal deafness, via the mastoid, is not only irrational, but, in our opinion, is an interference full of risk of injury to the patient.—ED.]

Acute Otitis Media, Especially in Children.—In this disease the diagnosis is of prime importance, as shown in an article by W. CHEATHAM (*Pediatrics*, March 15, 1898). If pus is present in an acute case it must be evacuated promptly, or the child's life is in danger.

After the discharge is established, the less treatment the ear receives the better. Inflations should never be employed, as they force septic matter from the nose into the ear, or from the ear into the mastoid, as shown by B. T. MOUSER (*Pacific Medical Journal*, August, 1897). [The removal of the matter from the middle ear is impossible if the perforation in the membrana is small; if the perforation is large, the matter flows freely from the drum cavity into the auditory canal, the natural drainage-tube of the middle ear in time of suppuration. At such a time, whether the perforation is large or small, everything dropped or syringed into the ear tends to stem and impede this natural and beneficial outflow and bring about secondary infection of the middle ear and mastoid antrum. I have never yet seen a case of acute mastoiditis consecutive to acute otitis media that was not the artificial result of medication applied, often by the patient or his friends, sometimes by his physician, to the primary otitis after the membrana had ruptured and discharge had set in. This discharge is beneficent, as it carries off pathogenic germs, and is no more to be checked than the resolution of a pneumonia is to be stayed. We favor expectoration in the latter case; we do not syringe and swab and medicate the mouth, pharynx, nor trachea. We should favor the aural discharge by not impeding or risking the impediment to its escape by the auditory canal. Hence, the safest plan is to apply nothing, either wet or dry, to the auditory canal when the discharge sets in from the acutely inflamed middle ear.

The pus in such cases is something like a foreign body; it will not reach the brain, unless pushed there by artificial means, too often called medical treatment. The proper time to syringe the acutely inflamed ear is before rupture or paracentesis of the membrana, so that when discharge does set in it escapes into an aseptic canal, free from staphylococci, the chief elements in the induction of secondary infection and chronicity.

Acute inflammations of the middle ear having been diagnosed, dry heat should be applied over the ear. This often brings about resolution. All forms of instillations should be avoided. They are rarely endured by the inflamed ear, and they may excite further inflammation. If pain increases under dry heat, and spontaneous rupture is delayed for six or eight hours, then there is only one thing to do, viz., incise the drum membrane at its most inflamed and protuberant point. This may be done under general anaesthesia, especially in a child, if its general condition permits. But if the surgeon knows how to do it, it is not a painful operation. Scraping the auditory canal in performing paracentesis is more painful than paracentesis itself, as the membrana is not as sensitive as the skin of the auditory canal. The discharge may not flow copiously for an hour after paracentesis, especially if the latter has been delayed until inspissation of secretion has occurred. After paracentesis or spontaneous rupture and the occurrence of discharge from the ear, let the ear alone, so that it may drain itself. Matter as it appears at the meatus may be gently mopped, not swabbed, away with absorbent cotton or sterilized gauze. Swabbing irritates the canal and causes furuncles. Syringing is rarely, if ever, demanded, and peroxide of hydrogen never.

If these latter applications are made to the acutely inflamed ear, mastoiditis usually results, and hence the large and increasing numbers of reported cases of acute mastoiditis secondary to acute otitis. If syringing and the use of peroxide of hydrogen are avoided, especially the latter, there will be no mastoiditis consecutive to acute otitis media. The former lesion is purely artificial and unnecessary, according to my experience.—ED.]

The pernicious results of the poultice-treatment and use of Politzer inflation in acute otitis media, resulting in secondary infection of the mastoid and production of mastoiditis, are well demonstrated by two cases reported by J. H. BRYAN (*Journal American Medical Association*, March 5, 1898). In one of these cases gravitation of pus from the mastoid into the neck had begun. Both cases finally recovered after mastoid trepanation by chiselling.

Indications for Trepanation of the Mastoid Process.—The indications for opening the mastoid when diseased in consequence of chronic purulent otitis media are comparatively easy; the indications for opening the mastoid when it is diseased in consequence of acute otitis media are, as a rule, extremely difficult. E. RIMINI (*Berlin. klin. Woch.*, March 14, 1898) assumes that in every case of acute otitis media there is a simultaneous purulent infiltration of at least the aditus and the antrum, if not of all the mastoid cells, as has already been pointed out by Politzer and others, and accepted by all aurists of experience. Consequently, in all cases of acute otitis media there is tenderness of the mastoid on pressure, without any other external symptoms in the cortex. But this fact alone does not warrant opening the antrum in every case of acute otitis media, for we all know that under cautious, conservative antiseptic and aseptic treatment the vast majority of acute otitides recover entirely without mastoid interference.

The course, however, of acute purulent otitis media is not always so favorable; sometimes, especially if the treatment of the primary acute disease has been defective, the pains in the mastoid increase and are felt not only

on pressure, but occur spontaneously. "Inflammatory œdema of the mastoid ensues, the auricle is pushed forward, and to these objective symptoms there are added headache, elevation of temperature, and in some cases chills. This is a group of symptoms demanding immediate surgical interference, for it shows that an abscess has formed in the mastoid. Since such abscesses tend to spread, the proximity of mastoid empyema to the brain is a menace to the entire organism." (Rimini.)

We may deduce that, as a rule, empyema of the mastoid cells arises from empyema of the antrum, which is really part of the drum cavity. From that point sometimes the empyema extends downward and backward to the mastoid cells. It must be borne in mind that periostitis of the mastoid process consequent to an otitis externa that often accompanies an acute purulent otitis media can also produce inflammatory œdema of the skin of the mastoid and projection of the auricle, often accompanied, also, by headache and fever, and thus give rise to the suspicion of the presence of an empyema in the mastoid. But the rapid disappearance of these symptoms upon antiphlogistic treatment of the external ear and skin of the mastoid lead to a differential diagnosis. Unfortunately, however, a mastoid abscess does not always occur with such marked and characteristic symptoms, but runs a "latent" course with uncertain symptoms. We are then obliged, as Rimini shows, to depend for the diagnosis of mastoid empyema upon other symptoms, such as continuance and increase of the discharge beyond four or five weeks, when there is no dyscrasia present to account for it, comparatively insensitive prolapse of the posterior superior wall of the auditory canal near the membrana, and sometimes headache, though the latter is likely to be absent if the drainage from the mastoid through the antrum and middle ear into the auditory canal is good. In the latter instance, however, instead of headache, there will be a sense of fullness in the head, this latter symptom alternating with attacks of headache of more or less severity. In other words, if mastoid disease in connection with either acute or chronic purulent otitis media is attended with well-marked objective or subjective symptoms, especially the former, the diagnosis is easy. If antro-mastoid disease is not thus attended with well-marked objective symptoms, but is of the so-called "latent" variety, it may puzzle the most expert diagnostician of ear diseases. Whether or not we are justified in an exploratory operation in all doubtful cases, both acute and chronic, remains to be seen.

Otic Cerebral Abscesses.—F. MARSH (*British Medical Journal*, April 30, 1898) reports five cases of cerebral abscess from chronic purulent otitis media. Three were uncomplicated abscesses in the temporo-sphenoidal lobe, and diagnosticated as such for the following reasons: 1. A long history in each case of the chronic purulent ear disease, twenty-five, fourteen, and nine years respectively. 2. No mastoid tenderness excepting in one case, and no tenderness on percussion over the sigmoid sinus. 3. No thrombosis of the internal jugular vein. 4. No high or greatly varying temperatures, and pulse not rapid. 5. Absence of pyæmic symptoms, in the main. 6. Cerebration little affected in the early stages, but becoming slow later. 7. Marked emaciation. 8. A chronic course terminating in coma. The abscess in these cases was deemed temporo-sphenoidal rather than cerebellar, because

there was no occipital headache, no marked vomiting, nor disturbance of equilibrium, no sensory aphasia, and no implication of the sixth nerve. In these cases the fifth nerve was early involved, and a dental surgeon was called upon in one case to "eliminate a possible dental cause for the pain." These three cases were relieved by operation on the mastoid and cranium.

The same author reports (*loc. cit.*) multiple brain abscesses in the white substance from chronic otitic purulency, secondary to septic thrombosis of the lateral sinus, in a case of a boy of nineteen. Operation failed to relieve the patient.

Marsh also shows that temporo-sphenoidal abscess from chronic purulent otitis media may be complicated by septic basal meningitis, as in the case of a boy, aged nine years. In this case there was also a mastoid abscess. Operation upon the mastoid and cranium was not followed by relief.

Marsh (*loc. cit.*) draws attention to the fact that "commencing coma still seems to be the signal for surgical action, and that this is not too late is shown by the complete and rapid recovery "in several of his cases, and similar ones elsewhere." His experience leads him to hope, however, "that an exploratory operation might with advantage be undertaken without waiting for coma in all cases presenting symptoms", strongly indicative of the presence of pus in the temporo-sphenoidal lobe or elsewhere in the brain. "If there is much doubt as to the location of the abscess, temporo-sphenoidal or cerebellar, or possible implication of the sigmoid sinus, the method suggested by Mr. Percy Dean should be followed, and a crown of bone removed, one and one-quarter inches behind and one-quarter inch above the centre of the external meatus, through which all these regions can be explored. . . . If there is any mastoid tenderness the antrum should always be opened first, and the surrounding parts carefully examined for any evidence of extension from this cavity."

DERMATOLOGY.

UNDER THE CHARGE OF

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Erythema Induratum of Bazin.—CH. AUDRY (*Monatshefte für prak. Derm.*, 1898, No. 10) asks the question, What do we know about this malady? and concludes from histological investigations (of one case) that we are not justified in regarding it as belonging to the group of tuberculosis of the skin. Histologically, it consists of a fatty induration, together with an independent and considerable œdema of the connective tissue that shows no signs of inflammation. The author does not think his observations

justify looking upon the disease as a scrofulous manifestation (the usually accepted view). He inclines to the opinion of Hardy, that it is probably nothing more than a chronic, relapsing, and ulcerating form of erythema nodosum.

Lichen Scrofulosorum.—HAUSHALTER (*Annales de Dermatologie et de Syphiligraphie*, 1898, No. 5) reported two cases of lichen scrofulosorum at a séance of the Société Française de Dermatologie et de Syphiligraphie, which presented the following features: In both cases the eruption was present upon the face, as well as upon the trunk and extremities, and followed an attack of measles. The eruption consisted of small, rose-colored papules having an epidermic crust in the centre. Frank suppuration of these lesions was never observed; they gradually disappeared, leaving minute, depressed cicatrices. Inoculations practised upon guinea-pigs with curetted lesions produced tuberculosis.

Herpes Zoster.—WEBER (*New York Medical Record*, July 9, 1898) finds that a dusting-powder composed of equal parts of subgallate of bismuth and talc is a useful application in herpes zoster; where this does not prove effective, an ointment containing one part of subnitrate of bismuth to three parts of cold cream will relieve the burning. For the neuralgia which so often accompanies or follows it, quinine in large doses given two or three times a day, continued to the point of tolerance, is probably the best remedy; iodide of potassium, strychnine, and galvanism may be employed after quinine fails. Careful nursing and management are important adjuncts to the treatment.

Some Undescribed Forms of Herpes Tonsurans.—STERN (*Archiv für Dermatologie und Syphilis*, Band xlv.), in an epidemic of herpes tonsurans in Mannheim, observed a considerable number of unusual forms of the disease. In two cases the malady attacked the mucous membrane of the lower lip and the cheek, spreading from the chin. In one case there were large, partly hemorrhagic blebs in the face, accompanied by nodules in the beard and kerion of the temple. In this case there was likewise a marked swelling of the left external ear, which was dark red and moderately painful to the touch. This affection of the ear had existed for six months. Numerous mycelia were found in the pus expressed from a small opening upon the upper edge of the helix. In a case characterized by a squamous and nodular eruption situated upon the nape of the neck, ulcerative destruction of one of the nodules occurred, producing an ulcer 2 cm. in diameter. In the case of a girl aged seventeen years, having numerous scaly plaques scattered over the trunk and extremities, in which fungus was demonstrable, there were numerous more or less elevated nodules situated over the sacrum, on the buttocks, the breasts, abdomen, and upon the anterior and posterior surfaces of the thighs. In a few instances lanugo hairs extracted from these nodules were found to contain fungus.

Ringworm as it Appears in Boston.—C. J. WHITE (*Journal Boston Society Medical Sciences*, May, 1897) gives his conclusions, based upon about

two hundred microscopical examinations and between three and four hundred inoculations. The *microsporon Audouini* occurs in the majority of cases of ringworm of the scalp; in Boston, 95 per cent. of all cases are due to this fungus; in Paris, 60 per cent., and in London from 80 to 90 per cent. This fungus has not been found on the scalp after the age of fourteen years. In France this variety has not been isolated from the beard or from the smooth skin; but in England it has been found in the beard, and in Boston it was encountered three times in the beard and three times on the general surface of the body. Thus, in Boston it is the commonest form of ringworm, causing 56 per cent. of all cases of the affection. It always occurs on the outside of the hair, and consists of innumerable small (about 3 micromillimetres in diameter), round spores arranged like a mosaic, rarely any mycelium.

The *megalaspora* occur both inside and outside the hair, at times the entire shaft being invaded and surrounded, and are from 5 to 7 micromillimetres in diameter. They are not round, but rectangular, and the mycelium is always present. A few drops of ether, followed by 40 per cent. solution of caustic potassa, applied to the hair reveal these fungi.

Dermatoses Albuminuricæ.—MERK (*Archiv für Dermatologie und Syphilis*, Band xliii.) considers, under this title, those affections of the skin which are intimately associated with albuminuria: these are (a) a certain kind of eczema; (b) pruritus; (c) urticaria; (d) erythema; (e) furunculosis. Albuminuric eczema is a sharply circumscribed, papular, chronic eczema occurring in persons of advanced age, having its most frequent seat on the leg, more rarely on other parts of the body, accompanied by intense itching which resists all therapeutic endeavors for its relief, but which may completely disappear spontaneously with the formation of pigment. Albuminuric pruritus is the most frequent dermatosis accompanying Bright's disease, and is usually universal in its distribution. The course of the kidney affection and the variations in the quantity of albumin contained in the urine are without influence upon the variations in the intensity of the itching. This form of pruritus increases in summer; it is not distinguishable in its external features from other forms of pruritus, such as occur in diabetes, in pregnancy, or from indigestion. Urticaria is associated with albuminuria almost as frequently as pruritus, the former being often the forerunner of the latter. Erythema and erythema-like efflorescences are much less frequent in albuminuria than pruritus and urticaria.

The Radical Treatment of Lupus.—URBAN (*Monatshefte für prak. Derm.*, 1898, No. 9) compares the treatment of lupus to that of cancer, and recommends extirpation of the disease in all cases where this procedure is at all practicable. There exist inoperable cases just as in carcinoma and sarcoma, especially those in which the disease is disseminated and superficial. Transplantation is recommended in suitable cases.

On Miliary Tuberculosis of the Skin.—KAPOSI, of Vienna (*Wiener med. Woch.*, 1897, No. 40), discusses the question of tuberculosis of the skin in its various manifestations, and arrives at the conclusion that "tuberculosis

propria seu miliaris" is a well-defined clinical process, different from lupus and all other forms of the so-called tubercloses. Though rare, it is commoner than is generally supposed. It occurs in almost all cases together with other manifestations of tuberculosis, chiefly of the respiratory tract. Tuberculosis of the skin occurs very often with the same disease occupying the neighboring mucous membranes. These local forms (of the skin and mucous membrane) do not possess an absolutely unfavorable prognosis, as they may heal spontaneously or be cured by local or general therapeutics.

Treatment of Tuberculous Processes with Pyrogallol.—VEIEL (*Archiv für Dermatologie und Syphilis*, Band xlv.), as the result of considerable experience with this remedy, regards its use, in many cases, preferable to any surgical treatment, the only disadvantage attending this method of treatment being its long duration. The manner of employing it is as follows: The diseased parts are first destroyed by means of a 10 per cent. pyrogallol vaseline, which, spread upon lint, is applied for three to five days. The healing of the wound thus produced is allowed to take place under $\frac{1}{2}$ to 2 per cent. pyrogallol vaseline, which is strong enough to destroy lupus tissue without hindering the formation of sound granulations.

Monochloracetic Acid in the Treatment of Xanthoma.—McGUIRE (*Journal of Cutaneous and Genito-urinary Diseases*, July, 1898) reports the cure of several cases of xanthoma by applications of monochloracetic acid. These applications were free from pain, but were sometimes followed by considerable swelling, which, however, soon subsided. The acid should be applied to a small surface at a time only. It first turns the lesions white, but in a short time a dark crust appears, which should be allowed to separate spontaneously.

Urticaria with Recurrent Hæmatemesis.—CHITTENDEN (*British Journal of Dermatology*, May, 1898) reports the following case: An unmarried female, aged thirty-three years, suffered from attacks of urticaria which, at first, differed in no respect from the usual type; but later these grew more severe, being accompanied by swelling of the lips, tongue, and nasal mucous membrane, and dyspnoea, lasting three or four hours. These attacks usually lasted about a week. Some three or four months after the beginning of the attacks the patient was seized one morning with severe nausea, and vomited large quantities of blood; this was followed by immediate relief, and the urticaria disappeared within a day or two. Two months later there was a similar attack, the hæmatemesis being followed as before by the rapid disappearance of the eruption. In subsequent attacks, which were much milder, there was no hæmatemesis, but melæna was present. In the way of treatment, change of air, with absolute rest and freedom from worry, seemed to give the best results.

Lactophosphate of Lime in Acne and Furunculus.—H. S. PURDON (*Dublin Journal of Medical Sciences*, February, 1898) refers to the researches of Dusart on this drug, and states that he has derived benefit from its use when given in certain forms of acne, especially when large or hypertrophied,

and also in boils. In cases of the latter, combined with iron, it is more useful, while a favorable and palatable recipe, where cod-liver oil is thought to be required, is the following: Take of gum arabic, 3x; water, 3j; syrup of lactophosphate of lime, 3iij; cod-liver oil, 3iv; essence of bitter almond, miiij. Phosphate of lime is not merely a drug "able to harden bones," but becomes an active agent in nutrition. In acne and similar diseases due to nutritive debility, it is often distinctly valuable—often more so than calcium sulphide.

A New Human Parasite of the Sarcoptic Tribe.—RUDOLPH MENDER, of San Antonio, Texas (*Journal of Cutaneous and Genito-urinary Diseases*, September, 1897), gives the following history of a case: Eight months before, the patient, an aged man, residing in Texas, became affected here and there with small, fiery-red papules, which at times under treatment seemed to get well, but at other times under local remedies to reappear. There was no itching, but at times slight burning. "The animalculæ, it seems, on maturing, emerge from the skin;" . . . "various remedies cause many of all sizes to come to the surface, some bore under the skin again, and, although I have picked off thousands, I have never seen one move. One of the annoyances to the patient is their crawling on the skin. Their bite is much like that of a flea or a chinch, and often so rapidly is it done that the mite will bore in before you can pick it off with the point of a knife. The bites and pimples never suppurate nor exude serum." The case was studied for eight months by several physicians, including Drs. Flemming, Boecking, and Allen J. Smith, the latter believing that the parasite corresponded with the genus *choriopes*, species *ecaudatus*. Scabies and pediculosis were excluded. Illustrations accompany the article.

OBSTETRICS.

UNDER THE CHARGE OF

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The Intra-uterine Use of the Colpeurynter.—KLEINHAUS (*Monatsschrift für Geburtshülfe und Gynäkologie*, 1898, Band vii., Heft 2) reports a series of seven cases where it was imperative to end labor rapidly, in which good results were obtained by placing the colpeurynter in the uterus, and thus securing prompt delivery. He considers this method useful in eclampsia when dilatation has already commenced. Where there are pathological changes in the uterus the use of elastic bags is not advisable, for labor pains may become weaker instead of stronger under their use. In abortion, where

it is necessary to dilate the uterus, solid dilators are better. Bags made of inelastic material are most efficient.

The Etiology of Hydramnios.—OPITZ (*Centralblatt für Gynäkologie*, 1898, No. 21) has been impressed by the familiar fact that the foetus is usually dropsical in cases of polyhydramnios. He found by experiment that normal amniotic liquid contains no substance which increases the production of lymph or irritates the excretory organs.

On the contrary, in hydramnios the amniotic liquid when injected into animals at once increases the formation of lymph, and greatly irritates the kidneys. As the foetus evidently swallows amniotic liquid, there is set up a vicious circle by which irritating material is kept in constant circulation in the blood of mother and child.

Appendicitis Complicating Pregnancy.—In the *Annales de Gynécologie*, 1898, vol. xlix., PINARD reports the case of a woman, aged twenty-five years, and six months pregnant. A typical attack of appendicitis occurred, and on the fourth day operation was performed for swollen belly, feeble pulse, and evident sepsis. On incising the abdomen pus escaped; a second incision was made in the left lower quadrant, and a similar condition found. Abortion occurred that night, followed by death of mother and foetus. On making cultures from the umbilical cord, the colon bacillus was found in abundance, having evidently escaped through the ruptured appendix.

Ophthalmia in the Newly-born.—In the *Medical Press and Circular*, 1898, Nos. 21 and 22, STEPHENSON contributes an excellent practical account of this disorder and its treatment.

He draws attention to pre-natal infection, and in most cases thinks infection occurs soon after birth by opening or rubbing the child's eyes. Gonococci are the cause in two-thirds of all cases. He urges thorough examination under ether, if needed. While gonococci are usually found, other germs may be present.

He advises nitrate of silver, 10 grains to 1 ounce distilled water, twice daily; applied by brush, of cotton, on German silver rod. It is unnecessary to remove excess with salt solution. Antiseptic solutions should be applied twice daily, not with syringe, but with cotton. To prevent adhesions of lids an antiseptic ointment should be used. Unna's is a good one: 3 per cent. hydrogen peroxide, with lanolin and vaseline. He considers complicated apparatus for treatment unnecessary.

On an average, 10 per cent. of children so affected lose one or both eyes. If the cornea is clear when the child is first submitted to treatment, the prognosis is good.

Partial Occlusion of the Pelvic Brim by the Soft Parts.—In the *British Medical Journal*, 1898, No. 1954, WILLIAM C. LUSK contributes a very interesting description of frozen sections of a woman who died in the first stage of labor. Among other interesting details which the study of these sections affords, the practical point is brought out that the pelvic brim in this patient was so lessened by the soft parts that a normal bony pelvis was

changed into a justo-minor pelvis. The narrowing of the brim from this cause was in the transverse diameter nine-tenths of an inch on each side ; in each oblique diameter one inch behind and six-tenths of an inch in front.

[This affords a rational explanation of tedious labor so often observed in stout women.—ED.]

An Unusual Mechanism of Labor Complicated by Myoma of the Womb.—In the *Münchener medicinische Wochenschrift*, 1898, No. 20, FALK reports the case of a multipara, aged thirty-six years, who had had five spontaneous labors. In her present labor pains were accompanied by free bleeding. On examination a hard tumor was found in the posterior cul-de-sac. The membranes were immediately ruptured, when the feet presented and the border of the placenta could be felt just above. As bleeding continued, the feet were brought down and the child delivered. The placenta was found partly separated, and easily removed. The patient made an uninterrupted recovery.

Examination a few months after showed the tumor to be a myoma as large as a man's fist. The placenta had been partly separated early in labor, and the child doubled upon itself, the feet descending. Operation for the removal of the tumor was declined.

Neglected Shoulder Presentation Complicated by Rupture of the Uterus, with Recovery.—In the Clinical Report of the Rotunda Hospital (*Dublin Journal of Medical Science*, June, 1898) is reported the case of a multipara who received a severe kick in the lower abdomen. Tedious and neglected labor followed, with shoulder presentation and protrusion of the foetal hand.

On examination the child was found dead, the uterus ruptured and tightly contracted. Delivery was accomplished by decapitation. The rent in the uterine wall was three inches in length, in the lower segment to the right and posterior. A thick plug of iodoform gauze was passed through the rent, a hypodermatic of ergotin was given, and the patient removed to the hospital, where she received aseptic care. The gauze was removed in twenty-four hours. The patient made an uncomplicated recovery.

Seventy-four Years' Experience in the Induction of Labor.—An interesting account of a long and valuable experience is given by MOIR, Consultant to the Royal Maternity Hospital, Edinburgh (*Scottish Medical and Surgical Journal*, 1898, vol. ii., No. 6).

In direct contrast to the forced, rapid labor of the French, he has practised the gradual dilatation of the cervix, never attempting delivery until the cervix was thoroughly softened. He strongly deprecates haste in these cases, and urges patience and very gradual delivery.

His method consisted in allowing a few ounces of the amniotic liquid to escape through a male silver catheter, which was gently inserted between the uterus and membranes for several inches. The point of the catheter had been cut off, and the stylet was gently pushed through the membranes. He occasionally followed this by the use of tents or of a small Barnes' bag. He dilated the cervix with a steel rectal bougie which was introduced daily

for several days, the fingers and instrument passing about the cervix to gradually loosen the membranes. He did not attempt delivery until the parts were thoroughly softened, when he completed dilatation with the fingers and delivered often by version. He usually induced labor at the end of the seventh month, and allowed a week for the induction of labor.

He operated on twenty-six patients, who gave birth to seventy-two children, of whom thirteen were stillborn. On one patient labor was induced eight times. He lost two mothers from puerperal septic infection.

[While we acknowledge the value of caution in delaying delivery until the parts are softened, we cannot consider these results as especially good. Foetal mortality is very high in this series of cases, and the author's methods call for more frequent manipulation and interference with the uterus than is desirable.—ED.]

Intra-uterine Typhoid.—In the *Scottish Medical and Surgical Journal*, 1898, vol. iii., No. 1, FORDYCE reports a very interesting case in which typhoid was demonstrated in a five-months' foetus. The mother aborted and died soon after. No autopsy could be obtained, but there was no doubt about the diagnosis.

Externally and internally nothing abnormal could be seen by the naked eye in the foetus or its appendages. There was a small quantity of serous fluid in the abdomen. The intestines seemed quite healthy; the liver and spleen were not enlarged. Tubes inoculated from the kidney, spleen, and intestinal contents gave pure cultures of the typhoid bacillus; the blood was sterile. Care was taken to make tests, which showed the absence of the bacillus coli communis. It was impossible to demonstrate bacilli in the tissues by microscopic examination. The Widal test was very successful in this case.

Osteomalacia and Its Treatment.—In the *Monatsschrift für Geburtshülfe und Gynäkologie*, 1898, Band viii., Heft 1, STIEDA reports several cases of osteomalacia in which he minutely studied and described the changes occurring in the muscles. He draws especial attention to the paralyses present, and brings out the interesting fact that osteomalacia may occur without lesions of the bones which are readily apparent.

In regard to treatment, non-pregnant cases do well with the administration of phosphorus and the use of saline baths. If a faithful trial of these measures is without result, removal of the ovaries is indicated. Pregnant cases often do well with the bath and phosphorus treatment. When important changes in the pelvis are threatened, pregnancy should be interrupted. Should Cæsarean operation be done, the uterus, tubes, and ovaries should be removed.

FEWSON (*Monatsschrift für Geburtshülfe und Gynäkologie*, 1898, Band viii., Heft 1) concludes from his experience in the treatment of osteomalacia that castration is the surer method of treatment when no complications are present which forbid operation. The phosphorus treatment is often of service, especially in patients too old to bear operation well.

Operators must bear in mind the fact that the abdominal walls are often so stretched and altered in these cases that bad union follows abdominal

section. This results from the overdistention caused by the spinal deformity, which throws the viscera forward against the muscles of the abdomen, from the cough which is often present, and from the badly nourished condition of these women. The abdominal wall must be closed in layers, and every precaution taken to secure good union.

Rupture of the Uterus by a Bougie; Abdominal Section; Recovery.—GUÉRARD (*Centralblatt für Gynäkologie*, 1898, No. 27) reports the case of a woman, aged twenty-seven years, who had a swollen abdomen and was supposed to be pregnant. Pains began, but as progress did not follow, the attending physician introduced a bougie to induce active labor. When called in consultation, Guérard found by careful examination that the uterus was empty, but that a condition was present which was not clear, and justified section.

On opening the abdomen ascites was found, and a large quantity of fluid escaped. Tubercular pelvic peritonitis was present, and the uterus had been ruptured on its left side by the bougie. The edges of the rent were trimmed and united with catgut. The patient recovered without complications.

Rupture of the Uterus; Abdominal Section; Recovery.—ORTHMANN (*Monatsschrift für Geburtshülfe und Gynäkologie*, 1898, Band vii., Heft 4) reports the case of a multipara who aborted spontaneously between the third and fourth months. The fœtus escaped; the appendages remained. On examination rupture of the uterus on the right side was found, while the membranes had escaped through the rent.

On opening the abdomen blood-clots were found between the layers of the right broad ligament. The fetal appendages were not readily removed, and an incision was made through the peritoneal covering of the broad ligament, when clots and appendages were readily evacuated. The broad ligament and uterus were carefully closed with continuous catgut suture, the womb thoroughly cleansed, and the vagina and external parts thoroughly disinfected. The patient made a good recovery.

In this case an attempt had undoubtedly been made to induce abortion by a sound, which had caused the rupture.

Orthmann completes his paper with an interesting account of a neglected labor with shoulder presentation in which spontaneous rupture of the womb occurred. Although operation was performed, the patient died of septic peritonitis.

Superfœtation in the Human Race.—In the *Chicago Medical Recorder*, July, 1898, HERZOG describes three cases of abortion from which he carefully studied the specimens. In each two ova were expelled, and no doubt existed regarding the varying periods of gestation and that superfœtation had occurred. Microscopic examination of the specimens completes a remarkably clear demonstration of superfœtation.

Contracted Pelvis; Sapræmic Infection; Cæsarean Section; Recovery.—A remarkable recovery from puerperal sapræmia and Cæsarean section is

reported by REYINGA (*Nederl. Tijdschr. v. Geneeskunde*, 1898, No. 1). When operation was performed the patient had albuminuria, fever, and foul discharge; the child was living. The fundus was opened by transverse incision and the child delivered alive. As the uterine cavity had a foul odor, it was filled with iodoform gauze, the womb closed with catgut, and the vagina cleansed with lysol douches. Although fever persisted, recovery finally ensued.

A New Method of Influencing the Sex of the Fœtus.—The much-discussed theory of SCHENK, of Vienna, has found publication (*Magdeburg, Schallehn und Wollbrück*, 1898).

Briefly stated, the author believes that regulation of the mother's diet for the first four months can produce male offspring. Perfect nutrition in the mother favors the production of males. When an excess of unassimilated matter is present in the body, sugar appears in the urine. Accordingly, frequent examination for sugar should be made, and diet and hygiene varied accordingly. The book contains a discussion of older theories, among which the cross-production of sex receives partial acceptance.

Gunshot-wound of the Uterus and Child; Cæsarean Section; Recovery.—In *Medycyna*, 1898, No. 14, WRZESNIOWSKI reports the case of a multipara eight months pregnant, who received a wound in the abdomen from a pistol loaded with slugs. Fœtal movement ceased at once.

On abdominal section a ragged wound was found on the anterior surface of the uterus. Amniotic liquid was in Douglas' cul-de-sac. The intestines were uninjured. The womb was incised, the child and appendages extracted; no wound was found on the posterior uterine wall. The edges of the shot wound were trimmed and the uterus closed, a gauze drain placed behind the womb.

The fœtus had a number of wounds in the lungs and heart, and had been instantly killed.

The mother made a tedious recovery, complicated by prolonged fever.

Incision of the Fundus in Cæsarean Section.—Among the many reports of successful operations by this method, RIEDINGER, of the Brunn clinic, publishes the following (*Centralblatt für Gynäkologie*, 1898, No. 29):

He reports four operations. In one the upper half of the uterus was adherent to the peritoneum, which had undergone a chronic degenerative change. After recovery the adhesions recurred, and the uterus remained high in the abdomen.

In another case the membranes were adherent, and in removing them the right cornu of the uterus was torn, the bleeding ceasing readily on digital compression and catgut suture.

His operations were successful, and add to the accumulating evidence in favor of this method.

The Pathology of Osteomalacia.—In the *Annales de Gynécologie*, July, 1898, LABUSQUIÈRE publishes an extended inquiry into the changes in the ovaries present in osteomalacia. He can find no direct connection between the condition of the ovaries and the disease, and regards osteomalacia as a profound tropho-neurosis.

GYNECOLOGY.

 UNDER THE CHARGE OF

 HENRY C. COE, M.D., M.R.C.S.,
 OF NEW YORK.

Ligation of the Uterine Arteries in the Treatment of Fibromyoma.—GOTTSCHALK (*Annales de Gynécologie et d'Obstétrique*, 1898, No. 5) reports sixteen cases of fibromyoma in which he ligated the uterine arteries. In seven the tumors totally disappeared, while in fourteen they diminished in size. In selecting cases for operation the most important point to be noted is the site of the neoplasm. Interstitial tumors located in the lower or middle segment of the uterus are more apt to be favorably influenced than are intra-ligamentous growths and those situated at the fundus.

The patient's age is important; the most favorable results are obtained in women near the climacteric. Rapidly-growing tumors and those with general vascular adhesions, especially omental, are not apt to diminish in size after ligation of the uterine arteries.

Obstinate hemorrhage is the chief indication for the operation, but before proceeding with the ligation it is always advisable to explore the uterine cavity in order to discover and remove any submucous polypi which may be the direct cause of the bleeding.

Primary Carcinoma of the Fallopian Tube.—JACOBSON (*Ibid.*) reports the case of a woman, aged forty-five years, who had passed the climacteric a year before, and complained of colicky pains in the abdomen, watery discharges from the vagina, and decline in health. The uterus was small; in the cul-de-sac on the left side was an elastic tumor the size of an egg. It was enucleated by posterior section, and proved to be a soft, brain-like mass, which broke down readily. It was a portion of the tube sections of the lining membrane of which showed numerous epithelial ingrowths and alveoli filled with epithelial cells.

Cyst of the Round Ligament.—OULESKO-STRONGANOVA (*Ibid.*) describes a cyst removed from the round ligament near its uterine origin. It was as large as the fist, thin-walled, translucent, and was covered with dilated veins. Its wall was composed of muscular and connective tissue, with an inner lining of cylindrical epithelium, some of the cells being ciliated. In some places papillary outgrowths were seen; in others the epithelium was entirely absent. The writer believed that the presence of the ciliated cells proved that the cyst was developed from the remains of the Wolffian body.

Abdominal Tumor Complicated with Gall-bladder Adhesions.—FREUND (*Deutsche med. Wochenschrift*, 1898, No. 18) reports the following cases:

Case I.—In removing a large ovarian cyst from a patient, aged fifty-eight years, the writer encountered numerous visceral adhesions. After separating these, a firm attachment was found beneath the liver to a nodule which was

at first thought to be malignant, but was later found to be the gall-bladder distended with calculi. After removal of the cyst the abdominal incision was enlarged, the cystic duct was ligated, and the gall-bladder was excised. The patient made a good recovery.

Case II.—In this case a maiden lady, aged sixty-five years, had long suffered from a uterine fibroid. There were general vascular adhesions, which were especially firm in the neighborhood of the gall-bladder. The patient being a bleeder, it was necessary to tie each vessel separately. Hysterectomy was performed, and the patient survived for several weeks, dying of renal trouble.

Oophorectomy in Inoperable Cancer of the Breast.—CHEYNE (*British Medical Journal*, May 7, 1898) reports two cases in which he removed the ovaries under the conditions recommended by Beatson.

Case I.—The patient, aged thirty-four years, had a recurrence, with ulceration, after removal of the right breast and secondary excision of diseased axillary glands. The presence of extensive involvement of the glands of the neck made further operative interference unjustifiable. No evidence of visceral involvement. She consented to have the ovaries removed, which was done October 28, 1896, and she was kept under observation in the hospital for two months after the operation, when she was discharged in good health, with the ulcer nearly healed and the glands much smaller. Four and a half months after operation the ulcer was quite small, the surrounding skin-infiltration had mostly disappeared, a large, hard mass in the axilla was smaller and softer, and many of the glands in the neck could no longer be felt. Three months later her general, as well as local, condition was much worse, pleurisy developed, and the disease was progressing rapidly to a fatal termination.

Case II.—The patient, aged thirty-three years, when admitted to the hospital was very weak, having a rapidly-growing tumor of the left breast, with general glandular involvement. She had never had an operation, and was beyond help from surgery. With her consent, oöphorectomy was performed, and she was discharged four weeks later, apparently somewhat improved, some of the growths being smaller and softer. She was kept under observation, but grew steadily worse and died with metastases in the liver and pleura five months after the operation. In both cases thyroid tablets were given for three or four months.

In discussing these cases, which the writer regarded as typical ones for the operation (like Boyd's and Beatson's), attention is called to the fact that in the second the result was entirely negative, while in the first, though the improvement at first was marked, after six months the patient grew rapidly worse. Cheyne believes that there is a direct relation between the ovaries and the cancerous, as well as the normal, epithelium of the breast, but that the effect of oöphorectomy is temporary. It would, perhaps, be better to remove as much of the disease as possible at the same time with the ovaries.

Remote Results of Vaginal Hysterectomy for Fibromyoma.—BUSCHBECK (*Archiv für Gynäkologie*, Band lvi., Heft 1) reports one hundred cases (four deaths) in which the condition of the patient was known from one to

ten years after operation. Seventy-two per cent. were seen and examined. Sixty-five women were entirely cured and were able to perform their usual duties. Persistent nervous phenomena were few.

Many of the patients were greatly reduced from loss of blood before the operation, but were enabled to go through it safely by the use of subcutaneous injections of saline solutions.

Results of Vaginal Hysterectomy for Diseased Adnexa.—BUSCHBECK (*Ibid.*) reports sixty seven cases, with a single death; 89.5 per cent. of the women who were subsequently examined (forty-eight in all) were well and able to work. There were no fistulæ or exudates remaining. Few persistent post-climacteric phenomena were noted, though during the first few months following the operation there were usually slight menstrual disturbances, which gradually disappeared.

The writer believes that in nervous and hysterical patients removal of the diseased adnexa offers no prospect of an improvement of the neurasthenic condition.

Results of Curettement.—ALBERT (*Inaugural Thesis*; abstract in *Centralblatt für Gynäkologie*, 1898, No. 24) reports 163 cases of curettement for endometritis, in 74 per cent. of which a permanent cure was obtained; 3.1 per cent. were improved; 9.2 per cent. were no better after the operation. He recommends the application of liq. ferri sesquichlor. or tincture of iodine after curettement, practically in all cases, whether of menorrhagia or metrorrhagia.

Metrorrhagia in Children.—VETÈRE (*Arch. di Ostet. e Ginecolog.*, 1897, No. 10), while believing that most cases of so-called precocious menstruation are to be regarded as physiological, instances the following as an example of a pathological condition: An infant, aged seventeen months, had a slight vaginal hemorrhage which recurred four months later, and did not return for six years, when it began to appear at intervals of from two to three weeks, continuing for five or six days. As general treatment (electricity, hydrotherapy, ergot, etc.) was useless, a vaginal examination was made under anæsthesia when the patient was nine years old. The cervix uteri was found to be much hypertrophied and bled easily when touched. It was amputated, and the patient was promptly cured. The writer infers that the hypertrophy was the result of a virginal metritis, due to cold, masturbation, or some other exciting cause. The direct source of the bleeding was the granular condition of the cervical endometrium.

Pelvic Abscess of Appendicular Origin.—MONOD and VANVERTS (*Archives Gén. de Médecine*, May, 1898) conclude an interesting article on this subject as follows: A pelvic appendicular may accompany a peri-appendicular abscess situated in the iliac fossa, or it may exist alone and be entirely intrapelvic. In the former case the classical incision in the loin should be made; if it is feared that drainage will be imperfect, a counter-opening may be made in the vagina at once, though it will usually be done later. If the appendicular abscess is intrapelvic, a vaginal incision should be made when practicable; the abscess should never be punctured through the rectum unless spontaneous rupture into this canal is imminent. In male subjects and little

girls the abdominal incision alone is possible, the precaution being taken to peel off the peritoneum down to the level of the superior strait before opening the abscess. A counter-opening might be made in the ischio-rectal fossa, as suggested by Pollosson.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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AND

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Fluoride of Sodium as a Food Preservative.—In order to determine the preservative power of fluoride of sodium and to ascertain whether when used with food it can cause injurious effects, DR. PERRET, of the Sorbonne (*Annales d'Hygiène Publique et de Médecine Légale*, June, 1898, p. 497), undertook a series of experiments, using himself and a number of dogs as subjects. He first ascertained that the agent has a very decided influence in inhibiting the development of the lactic and butyric ferments. Milk containing 0.30 per cent. of it and kept at 38° C. remained unchanged long after the controls had become coagulated. In a second experiment a dozen tubes of preserved milk planted with the butyric ferment, and a dozen of normal milk similarly treated, were kept at a temperature of 38° C. side by side. At the end of three hours two of the latter were coagulated, and on the following day the other ten were in the same condition, while all the preserved specimens remained fluid. He next fed a dog weighing 15 kilos 10 grammes of butter, containing 0.5 per cent. of the salt, daily for twenty-nine days. The animal ate well, suffered no ill effects, and gained two kilos. in weight. Another smaller dog received repeated doses, two days apart, of 100 grammes of a saturated solution of the salt, without any other effects than salivation and diuresis. Subcutaneous injections of the salt to the extent of 0.08 gramme for each kilo. of body weight gave similar results; but larger ones, 0.01 per kilo., caused marked salivation, diuresis, and thirst, and refusal of food, and the animal did not return to his normal condition for two days. Intravenous injections, however, gave more positive results. Given to the extent of 0.10 per kilo. in this way, the salt caused immediate rise of pulse and respiration, followed by abundant salivation, nausea, and convulsions, and death in thirty-five minutes. A dose of 0.08 per kilo. gave the same results, but smaller doses than this were followed by recovery. Perret himself ate without apparent ill effects preserved butter as such and used in cooking every day for some time. His conclusions are that the salt is not poisonous when taken into the stomach, and hence may be used without danger as a food preservative.

[His own experiments suggest that before accepting his conclusions it would be wiser to extend the research.—C. H.]

Typhoid Fever and Infected Ice.—An outbreak of typhoid fever among the junior officers of a French regiment stationed at Rennes is attributed by DR. DORANGE (*Revue d'Hygiène*, April, 1898) to the use of ice obtained from the Vilaine at a point below the town, where the water was extensively polluted by the sewage of a large district in which there had been a number of cases of typhoid fever. All the regimental officers had been present at a dinner where, the food being the same for all, the beverages consumed differed in this respect, that the captains and other superior officers drank only beer, while the lieutenants, who were in a room by themselves, drank champagne-cup. It was only among the latter that the cases, eight in number, appeared. It was discovered that the ice used in making the cup came from the source above mentioned.

New Constituents of the Atmosphere.—Since the discovery of argon by Lord Rayleigh, Ramsay and Travers have discovered another gas, krypton, in liquefied air after getting rid of the nitrogen and oxygen. This has been followed by the announcement, on June 29th, by Professor Ramsay that he has discovered two more, which he has named neon and metargon (*La Nature*, July 9, 1898). Still another has now been detected by PROF. NASINI (*The Engineering and Mining Journal*, August 13, 1898), who has been working with Anderlini and Salvadori on the gases emanating from the earth in various places in Italy. He has succeeded in proving the existence of, but has not as yet isolated, the supposed element coronium, which has never before been observed in any terrestrial products, and has been known only from a line in the spectrum of the sun's corona. He predicts the discovery of still other elements in the gases under observation.

Industrial Hygiene—Matchworkers.—According to a report by DR. THOMAS OLIVER to the Home Office on the French match works, quoted by *The Lancet*, August 6, 1898, the prevalence of phosphorus-poisoning among the operatives has been greatly reduced since the investigation of the subject by the commission appointed by the government for that purpose in 1896. Rules have been adopted for the protection of the health of the workers, and in order that they may not escape notice they are read aloud on the first Saturday of each month to those whom they are intended to benefit. These rules provide that no food or drink shall be brought into the workrooms; that before meals the operatives shall remove their working clothes, wash their hands with soft soap, and gargle their throats with a preparation provided for the purpose; that no person under sixteen years of age shall be employed; and that all applicants for work must pass a medical examination showing that they have no bodily infirmity or contagious disease, that they have been vaccinated or have had smallpox, and that they have good teeth. As a result of the care taken there has not been a single case of phosphorus-poisoning during the year ended December 1, 1897, among the 575 men and women at the Pantin and Aubervilliers works. On the first appearance of symptoms of illness the worker is suspended, and while absent is given two-thirds pay. The report goes on to say that the French Government is endeavoring in every way to encourage invention and improvements tending to minimize the dangers of this occupation. Apropos of this comes

an announcement in *Le Progrès Médical*, June 25, 1898, that among the results of the stand of the government on this matter are a preparation invented for match heads which contains no white phosphorus or other noxious substance, and a new match-machine, which will still further reduce the dangers of manufacture. Only a few details to perfect the machine remain to be completed before its introduction into the works.

Disinfection by Formaldehyde.—DR. A. SCHLOSSMANN (*Berliner klinische Wochenschrift*, June 20, 1898) recommends for house disinfection a mixture of formalin and glycerin which, when volatilized by means of a special form of apparatus, makes a mist which, being heavier than the air, settles downward and carries mechanically all the organisms of the air with it. He finds that disinfection is complete and that the agent has great penetrating power.

[The results of most experimenters have demonstrated very conclusively that under the most favorable conditions as to temperature and moisture formaldehyde does not possess great penetrating power. How this power can be conferred upon it by the admixture of glycerin would be very difficult to explain. Certainly this quality cannot be derived from the special apparatus. —C. H.]

The results of experiments by DR. SYMANSKI (*Zeitschrift f. Hygiene und Infektionskrankheiten*, August 19, 1898) are in accord with those obtained by most investigators of this subject. He finds that the agent has no penetrating power, that it acts best in dry air with high temperatures, that it exerts no injurious action on furniture and other objects disinfected, and that it is the most expensive of all processes. He failed, where others have repeatedly succeeded, in destroying spores, and got less favorable results with paraform than with formalin from an autoclave.

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REMARKS ON RESECTION OF THE GASSERIAN GANGLION.¹

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WITH A PATHOLOGICAL REPORT ON SEVEN GANGLIA REMOVED BY
PROFESSOR KEEN.

By WILLIAM G. SPILLER, M.D.,

PROFESSOR OF DISEASES OF THE NERVOUS SYSTEM IN THE PHILADELPHIA POLYCLINIC.

UP to the present time I have done eleven operations for the removal of the Gasserian ganglion. The first of these cases was reported in the *Transactions* of the Philadelphia County Medical Society for 1894 and in the *Medical and Surgical Reporter* for March, 1894, in conjunction with Dr. John K. Mitchell. It was the fourteenth operation done on the patient. From the date of that operation, October 18, 1893, the patient has been well. Although his condition of mental anxiety lest the pain should return, and his mental instability as a result of his long-continued use of opium, are very marked, yet practically he is well of his neuralgia. He still has pain, but not the old tic.

In THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES for January, 1896, I reported five additional cases. The later history of these cases is as follows :

CASE II.—The operation was done June 18, 1894. No ganglionic cells or nerve-fibres were found in the tissue supposed to have been removed from the site of the ganglion. The pain returned in six

¹ Read at the twenty-fourth annual meeting of the American Neurological Association, held in New York, May 26, 27, and 28, 1898.

This paper was written for the volumes published in celebration of Prof. Durante's completion of twenty-five years' surgical teaching in the University of Rome.

months, though not so badly as before. It still continues (September, 1897).

CASE III.—Died in a week from septic infection.

CASE IV.—The operation was done May 2, 1895, and at present September 29, 1897, she is entirely well.

Of Cases V. and VI. I append a brief summary, since the examination of the specimens from these two cases is an important part of the pathological report which follows.

Of the remaining five cases (VII. to XI., inclusive), which have never been reported, I give only a brief *résumé* of each, sufficient to compare with the pathological report. I shall publish them more fully hereafter.

In conjunction with my own remarks on the removal of the ganglion, and as a very important addition to our knowledge of the pathology of tic douloureux, I have been so fortunate as to secure the co-operation of my friend, Dr. William G. Spiller, who has examined with great care the seven specimens which I had removed and which were as yet unexamined. In all of these ganglionic tissue was found. These specimens cover the cases V. and VI. of my second paper and all the five additional cases (VII. to XI., inclusive) here briefly reported. I consider myself most fortunate in being able to enlist the services of so accomplished a neuro-pathologist as Dr. Spiller, and the value of his contribution will be seen not only in the text, but in the beautiful illustrations, for which we are indebted to the skill of Miss A. G. Newbold.

It will be observed that of the eleven, ten were secondary operations, multiple peripheral operations having been done in all the cases before the ganglion itself was attacked, with the exception of one case (Case VIII.). In this case, all of the branches being involved, I removed the ganglion at once. All of the operations were done by the Hartley-Krause method. Of the eleven three died, one from direct and avoidable infection (Case III.), the other two of shock.

In six cases (VI. to XI.) an attempt was made to remove the entire ganglion, and the illustrations from photographs show that I was perfectly successful in Cases VI. and XI. in removing the entire ganglion with its roots, and reasonably successful in removing at least the ganglion itself in all the others. In Case VI., in which the entire ganglion, including its second and third divisions, and its sensory and motor roots were removed, Dr. Spiller was able to obtain sections which showed the microscopical condition of the ganglion as well as its physical relations with its sensory root and peripheral branches all in a single slide. As the motor root joins the third branch on the distal side of the ganglion, it could not, of course, be cut in the same plane as the other portion of the ganglion. In Case VIII. we were fortunate also to have a ganglion from a case in which no peripheral operation whatever had been done.

One disadvantage Dr. Spiller has labored under is that I was not aware at the time of my operations of the technical value of Nissl's method, or I should not have preserved the entire specimens in Müller's fluid, which prevents their examination by that method. The cellular changes, therefore, could not be studied in all their details, but the advantages of the selected method of hardening for an examination of the alterations in the intra-ganglionic nerve fibres are very great. The next specimen I have Dr. Spiller shall have perfectly fresh, and be able to examine it by the Nissl method.

CASE I. *Breaking up of the Gasserian ganglion after thirteen prior operations; done in two stages, on account of packing to arrest the hemorrhage; recovery; cure for four and a half years.*—Dr. K., aged forty-one years. He had suffered from neuralgia for thirteen years, and had had thirteen operations done, including removal of a large part of the upper jaw, as well as various branches of the nerves. Date of operation, October 18, 1893. The anterior branch of the middle meningeal passed through a canal and was, of course, torn in turning down the flap. In chiseling the posterior portion of the flap the posterior branch was also divided and the dura wounded. Both vessels were secured after much

FIG. 1.



The dark portion indicates the area of imperfect sensation.

trouble. The hemorrhage, on lifting the middle lobe, was so great that the cavity was packed, and the operation completed in a second stage after three days, the ganglion being broken up. The piece of gauze was found to measure thirty-seven by six inches, or two hundred and twenty-two square inches. This remained in the skull for three days, during which time his temperature had risen to 100.8° , and the respiration had gone down to from six to ten in a minute, with a slight aphasia. Immediate recovery followed the completion of the operation. He has suffered from temporary twinges of the pain, but except these he has been free from pain. His general health has never been very

good. This patient was examined in September, 1897, by Dr. Spiller, whose notes are appended.

"Dr. K. states that he has real pain at times below the right eye and on the side of the nose, but has no paroxysms.

"Sensation is imperfect in the area indicated (Fig. 1), but evidently not entirely lost. He perceives pressure on the right side of the tongue, but no pain from the stick of a pin. Sensation on the inside of the right cheek is much impaired, but not destroyed. Tactile sensation is preserved on the back of the right side of the tongue and on the soft palate.

"He cannot taste salt, vinegar, or quinine on the right side of the tongue, even at the tip.

"The right masseter muscle contracts well, and the lower jaw is moved from side to side (pterygoid muscles).

"On account of the continuance of some form of pain, the absence of total anæsthesia, the preservation of the motor root of the fifth nerve, as indicated by the contraction of the muscles of mastication, and the probably intact or nearly intact condition of the first and third branches, it is evident that only a small portion of the ganglion was destroyed."

CASE II. *Breaking up of the Gasserian ganglion; done in two stages, on account of hemorrhage, after eight prior operations; recovery; recurrence of attacks.*—C. H. B., aged about thirty-five years. Neuralgia began in April, 1886, apparently from the filling of a tooth. From 1889 to 1890 subcutaneous neurotomy was twice done, the antrum drilled, the right infra-orbital resected three times, and the right carotid was tied. The last five operations were done by Dr. John B. Roberts. In March, 1890, the sight of his right eye began to fail, and in February, 1891, another surgeon removed the crystalline lens. When first seen in June, 1894, the right eyeball was utterly useless, the face was shrunken over the antrum, and for three years he had never been free from pain.

Operation, June 18, 1894. The middle meningeal ran in a groove and was torn in turning down the flap; secured by ligature. On lifting the temporo-sphenoidal lobe, the hemorrhage was so profuse that the wound was packed with gauze, measuring sixteen by six inches (ninety-six square inches). Cultures at the first operation and when the gauze was removed were sterile. The second and third divisions were torn loose from the ganglion, and the ganglion itself broken up. Dr. Burr reported that neither nerve fibres nor nerve cells were found in the supposed tissue of the ganglion. In September, 1897, the patient wrote that he had frequent sharp attacks of pain.

CASE III. *Breaking up of the Gasserian ganglion after two prior operations; rupture of middle meningeal at the foramen spinosum; infection after operation; death from septic meningitis.*—Mrs. E. E. H., aged sixty-three years. Neuralgia began in 1883. In 1889 inferior dental removed by Dr. Thomas G. Morton. On February 23, 1892, I removed the inferior dental nerve, which had been reproduced, and the lingual nerve by trephining the vertical ramus of the jaw. Recurrence of pain in November, 1893. At no point was there complete anæsthesia on the left side of the face; but, on the contrary, a large part of the skin was hyperæsthetic.

Operation, February 20, 1895. The anterior branch of the middle meningeal ran in a canal and was ruptured. While lifting the temporo-sphenoidal lobe the middle meningeal ruptured at the foramen spinosum;

arrested hemorrhage by packing with gauze. During the operation a gentleman, not one of my regular assistants, without my knowledge, infected an instrument which was used in the wound. She died at the end of a week. Pyogenic cocci were found by culture.

CASE IV. *Breaking up of the Gasserian ganglion after five prior operations; done in two stages, on account of hemorrhage; recovery; cure for three years; necrosis of bone in the flap.*—Mrs. S. R., aged sixty years. Neuralgia in the second and third divisions of the right fifth, for which five operations had been done, the last being a division of both of the branches at the foramina rotundum et ovale.

Operation, May 23, 1895. Rupture of anterior branch of middle meningeal, which ran in a long canal in the bone. On lifting the temporo-sphenoidal lobe, the hemorrhage was so severe and continuous that I packed a piece of gauze, afterward found to be twenty-three by fourteen inches (three hundred and twenty-two square inches), into the wound. Three days later packing removed and ganglion broken up. Dr. Kyle reported undoubted ganglion cells in the tissue removed. The central portion of the section showed slight, if any, variation from the normal, but the outer portion showed some inflammatory infiltration. Sections of the nerves showed a thickened neurilemma (inflammatory), with infiltration of round and spindle cells. No apparent change in the axis cylinders or white substance.

At the present time (May, 1898) she is still free from pain and her general condition good. Some of the bone in the flap necrosed.

CASE V. *Curetting of the ganglion after two prior operations; rupture of the middle meningeal at the foramen spinosum; post-operative corneal ulcer; recovery; cure for two years and a half.*—Mrs. F., aged fifty-four years, was first seen July 15, 1891. Neuralgia, at first confined to the right inferior dental, had existed for twelve years following an abscess at the root of a tooth. In 1886 a half inch of the right inferior dental was removed, with relief of pain for eighteen months. It then returned in the superior maxillary division.

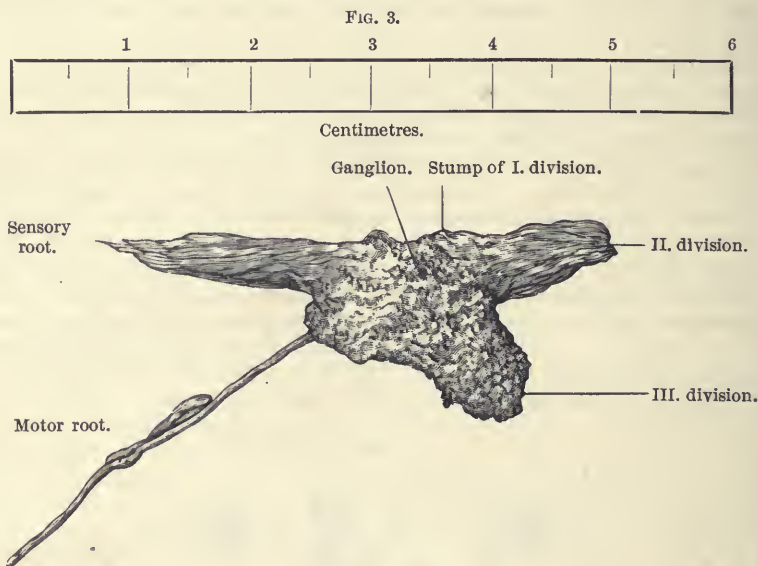


Gasserian ganglion (a) and second and third divisions (b and c respectively) from Case V.

July 17, 1891, I operated both on the inferior dental and the superior maxillary. The inferior dental was found reproduced and as large as the median nerve. This gave relief for over eighteen months. October 6, 1895, I operated on the ganglion. (Fig. 2.) In lifting the temporo-sphenoidal lobe the middle meningeal tore directly at the foramen spinosum. It was controlled by the Allis dissector, for which was substituted, first, the left forefinger, and then a small piece of iodoform gauze, which was packed into the canal. This iodoform gauze was removed on the third day. In a week the wound was entirely well.

On the third day after the operation a corneal ulcer developed. She went home November 27, 1895. The ulcer, which had been most skilfully treated by Dr. de Schweinitz, was then healing, and after very many vicissitudes, in the course of a year under the care of her physician, Dr. Moore, of Spartanburg, S. C., she recovered entirely. When last heard from, early in 1898, she was entirely well.

CASE VI. *Removal of entire Gasserian ganglion, with its second and third divisions and both its sensory and motor roots back to the pons in a piece four centimetres long, after four prior operations; recovery; complete cessation of pain for two years and a half; post-operative corneal ulcer.*—C. W. E., aged thirty-three years, was first seen November 16, 1895. Neuralgia began five years before, after an attack of diphtheria. In March, 1895, the right upper teeth and the right alveolar process were removed. Since then three other operations have been done, including the removal of the infra-orbital nerve and opening of the antrum.



Gasserian ganglion, with the II. and III. divisions and the sensory and motor roots removed from Case VI. The nerve bundles are well shown. The motor root is elongated by the accidental reversal of one of its bundles. (From a photograph which unintentionally was enlarged about one-third, but the scale of centimetres which was photographed with the specimen will serve for comparison.)

Operation, November 22, 1895. The eyelids were first stitched together. On lifting the temporo-sphenoidal lobe the middle meningeal tore just above the foramen spinosum. It was secured with a ligature. The ganglion was twisted out complete, as is seen in the drawing. (Fig. 3.) A profuse hemorrhage occurred as the ganglion was removed, which I judged to be from the cavernous sinus. It was arrested by packing a strip of gauze, ten by one and one-half inches. After an uncomfortable night, the next day he had severe frontal headache, and his temperature had risen to 104° . Though the gauze had only been in for

twenty-four hours, I deemed it necessary to remove it, and no hemorrhage followed. The wound was entirely healed on the eighth day. Four days after the operation the stitches were taken out of the lids, but within twenty-four hours signs of corneal ulceration began. The lids were then stitched together again. After a great deal of difficulty Dr. de Schweinitz, who cared for his eye, was able to save it, but with only partial vision.

This patient was examined by Dr. Spiller, October 5, 1897, and his notes are appended.

"C. W. E. states that he has not had the slightest pain since the ganglion was removed; he has not even once had any indication of a return of the suffering. With the exception of a 'drawing sensation,' he has had no paræsthesia in the affected area. He has had no trouble with fish-bones and cherry-stones remaining in his mouth. When he masticates he uses only the muscles of mastication on the left side. The hair grows as well on the top of the head, in the eyelashes, moustache, and beard on the right side as on the left, and he has to shave the beard on the right side as often as on the left. The skin also is normal. These are interesting statements in view of the supposed trophic functions of the fifth nerve.

FIG. 4.



The dark shading indicates the area of complete anæsthesia for all forms of sensation; the light shading indicates the area of hypæsthesia.

"*Sensation.* Complete anæsthesia exists on the right side of the face in the area indicated in the drawing. This area shades off into the region of normal sensation, as is also indicated in the drawing. (Fig. 4.) The total anæsthesia extends to the median line of the face, but the hypæsthesia extends a slight distance beyond the median line into the left side of the face. The right nostril is completely anæsthetic. The inside of the mouth and the right side of the tongue, including the point, are anæsthetic on the right side. The back of the tongue and the soft palate, as well as the left side of the tongue, are sensitive. The right cornea, conjunctiva, and auditory canal are anæsthetic.

"The sensation of the face was tested for heat, cold, pain, and touch. On the left side of the face sensation is normal.

"*Taste.* He has no sense of taste for vinegar, sugar, or salt on the right side of the tongue, even at the point, but all these substances are tasted at the back of the right side of the tongue and still better on the left side of the tongue.

"*Motion.* There is no contraction whatever in the masseter and temporal muscles of the right side of the face, while on the left side the contractions seem to be unusually vigorous. The muscles of mastication on the right side are entirely atrophied. Saliva at times drops from the right side of the mouth.

"*Ocular condition.* He has some sight in the right eye; he can count the fingers held before him, and says he sees them sharply, but that most objects have a hazy outline. He cannot read with the right eye. The left eye is good. The conjunctiva of the right eye is much injected, and the cornea is slightly hazy as compared with the left. The eyelashes of the right lower lid grow inward and irritate the eyeball, and he has had most of them pulled."

CASE VII. *Removal of the Gasserian ganglion after two prior operations, with portions of its roots; recovery; cure for two years and five months, and no return as yet of the severe pain, but some paræsthesia.*—Mr. J. McM., aged seventy-six years, was first seen with Dr. Charles A. Currie, December 28, 1895. A tall and vigorous man, apparently much younger than his age; arteries free from atheroma. Twenty years ago, without apparent cause, neuralgia began in the second division of the right fifth nerve. Nine years ago the late Dr. Agnew resected the infra-orbital nerve, and, as the pain returned shortly afterward, three years ago Dr. Thomas G. Morton again resected the same nerve. Soon after the second operation the pain again returned, and has extended to all the branches of the fifth, coming in paroxysms only a minute or two apart and extending over the forehead, cheek, and jaw, the point of severest pain being a little in front of and below the ear and in the tongue. He is scarcely able to speak. Meat is only eaten when finely cut up, and even then causes severe pain. The anterior wall of the antrum is gone.

Operation, December 31, 1895. One-half grain of morphine and one-twentieth of strychnine were given before the operation, and the latter was repeated twice during the operation. As in all the other operations, ether was used, the operation lasting two hours. An osteoplastic flap was turned down and the anterior branch of the middle meningeal, which was torn in doing so, secured. When I had turned down the flap I found that the dura was so firmly adherent to the bone that the outer layer of the dura had adhered to the bone over a considerable extent and left the brain covered only by the thin inner layer. At one point the dura was ossified over an area of one-half inch. Other small areas of ossification were also found under the temporo-sphenoidal lobe. The third division was at least one-half inch away from the middle meningeal, and was quite small, less in cross section than the second. In isolating the third division considerable hemorrhage took place, though no vessel was seen; it was arrested by pressure. The ganglion was then seized and, after dividing the second and third divisions, was twisted out, the roots being imperfectly removed. The third division tore and had to be removed separately. I particularly noted whether

avulsion of the ganglion caused any shock. Dr. Spencer, one of my assistants, held his finger on the pulse at the moment, and no perceptible effect was produced either upon the pulse or in any other way that could be noticed. The eyelids had been stitched together before the operation. In ten days he went home, his highest temperature having been 100°. Since then he has remained entirely free from pain.

For the histological examination of the specimens, see Dr. Spiller's notes of Case VII. Dr. Spiller's notes of the patient's condition are added.

"At the present time, May, 1898, his general health is excellent, he has gained twenty-five pounds, has no return of the *tic douloureux*, but has some obscure "creeping" feeling in his right face. His eye waters somewhat, but otherwise there is no trouble.

"Mr. McM. stated that when he ate cherries or fish the stones or bones, as the case might be, collected on the right side between the teeth and cheek, and were not noticed until two or three hours later, when they were moved to some more sensitive area of the mouth.

"He has never had a return of the old severe pain, but has had 'three or four different kinds of pain' on the right side of the face. At times he has a sense of itching, which begins at the right ala nasi, and is followed by a sensation as of worms creeping over the anæsthetic area. This seems to be in reality a form of *paræsthesia* and not of pain.

FIG. 5.



The dark shading indicates the area of total anæsthesia.

"The area of total anæsthesia is indicated by Fig. 5, and, by comparison with Fig. 490 (*Gray's Anatomy*, p. 731, edition of 1887, edited by Keen), is found to correspond quite closely to the distribution of the second branch of the fifth nerve, leaving the distribution of the first branch intact and impinging slightly on that of the third. Along the border of the anæsthetic area a pin-point is felt as dull pressure. Within the area the anæsthesia is complete, except that pressure causes a displacement of the parts pressed upon, and affects the surrounding sensitive tissues, and is perceived in this way.

"No sensation is felt on the inside of the right cheek, and the right side of the tongue is almost anæsthetic, but not entirely so. Sensation at the back of the mouth on the right side is impaired.

"According to his statements, the saliva escapes at times from the right corner of the mouth, and at night the lower jaw hangs somewhat. He can open his mouth only to about the width of one and a half inches, and is obliged to cut his food into small pieces in order to get it into his mouth. In opening his mouth the lower jaw goes somewhat to the right, and this is probably due to more vigorous action of the external pterygoid muscle of the left side. No contraction of the right masseter is felt, and none of the right temporal muscle.

"Salt and acid are tasted a little on the right side of the tongue and quite well at the point on the right side.

"No loss of vision has occurred, but he complains of impairment of sight, which, most probably, is a result of old age. No trophic lesions of the eye are noticed. As the first branch is probably not destroyed, judging from the distribution of the anæsthesia, trophic lesions of the eye could hardly be expected."

CASE VIII. *Removal of the Gasserian ganglion as a primary operation; possible tear of the cavernous sinus, controlled by packing; uneventful recovery; cure for one year and eight months.*—Mrs. A. W. S., aged sixty-nine years, first consulted me January 11, 1895. Her present trouble began eighteen years ago, with pain in the left face. In a few years all her teeth were removed. The pain is chiefly felt in the second and third divisions, but is also felt in the area supplied by the first division. Free purgation by sulphate of magnesium and later by castor oil was tried for ten days without result.

FIG. 6.



Gasserian ganglion, from Case VIII.

Operation, January 24, 1896. The usual Hartley-Krause flap was turned down. The anterior branch of the middle meningeal ran in a complete canal, the posterior in excessively deep grooves practically equivalent to canals. All of these branches were torn, therefore, in turning down the flap, but were rapidly secured. The ganglion was seized, the second and third divisions severed, and the ganglion twisted out. (Fig. 6.) In doing so the second division tore loose from the ganglion, and was lost in the rush of blood which followed its avulsion. The hemorrhage was so severe that I was inclined to think that the cavernous sinus was torn, though this was uncertain. Packing by gauze controlled it readily. The highest temperature, on the third day, was 100.6° F. The gauze was removed on this day without hemorrhage. For three days the eyelids were closed by a bit of sterilized cotton and a bandage and by the Buller shield afterward. I kept her under observation for three weeks, lest trouble should ensue with the cornea, but when she went home the cornea was perfectly normal. She has

had no return of pain for a year and eight months. For report on specimen, see Case VIII. of Dr. Spiller's notes.

CASE IX. *Removal of the Gasserian ganglion after one prior operation; wound of cerebral vessels while making flap; rupture of the cavernous sinus, packing with gauze; coma and hemorrhage, followed by death in three days.*—Mr. G. K., aged forty-nine years; father and mother died of old age. In his personal history the only thing of importance is that he had smallpox at sixteen years of age. Seventeen years ago the pain began in the right upper jaw near the canine tooth, gradually extending over the cheek. A number of his teeth were extracted, without relief. Seven years ago, at the Jefferson Hospital, the infra-orbital nerve was removed, giving relief for two and a half years on the cheek, but the pain in the forehead still remained. His pain has become entirely unbearable. It extends over the right forehead and sweeps down to the cheek. The lower jaw is not involved. When he is quiet a touch on the cheek does not cause pain, but the slightest touch on the forehead is followed by intense pain. For the last six or eight weeks the pain has been increasing greatly in severity.

Operation, April 21, 1896. The Hartley-Krause osteoplastic flap was made by means of Dr. Cryer's drill. In making the first small trephine opening, in spite of the utmost care, the trephine slipped inside the skull. This was followed by copious hemorrhage, showing that a large vessel had been divided. The flap was then quickly turned down. As soon as the dura was exposed an extensive clot was found

FIG. 7.



Gasserian ganglion, Case IX.

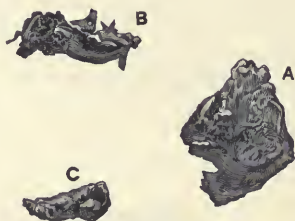
under it, having resulted from the mishap in the first small trephine opening. About an ounce of clot was removed; the source of the bleeding was a branch of the middle cerebral. The dura was then closed. The anterior branch of the middle meningeal ran through a canal and had been torn. This was ligated. The temporo-sphenoidal lobe was then lifted, the second and third divisions readily found, and the middle meningeal avoided. The ganglion was seized with a pair of hæmostatic forceps, the second and third divisions were separated, and I then attempted to twist out the ganglion. (Fig. 7.) In this I found two difficulties: one that the forceps did not grasp the ganglion with sufficient tightness to twist it, and the other that the third division had been only partly divided. The third division was then completely divided, and I removed the major part of the ganglion. A portion of the ganglion still escaped the jaws of the forceps. They were reapplied so as to get a good hold on the ganglion, but the moment that I began to twist it out a copious gush of venous blood convinced me that I had probably pushed the forceps too far inward and torn a rent in the cavernous sinus. The wound was packed with iodoform gauze immediately and the wound closed, leaving the packing in place. He reacted well; at the end of an hour his temperature was 97.4° F., but he was not yet conscious, and his puffing respiration made me suspect that the pressure of the gauze had produced what I hoped to be a temporary

hemiplegia. He remained, however, hemiplegic and unconscious till his death, at 1.20 A.M., on April 24th, almost three days after the operation. The temperature rose very little till about forty-eight hours after the operation, when it fluctuated between 103° and 104° F. The gauze (two hundred and sixty-seven square inches) was removed after forty-eight hours, without hemorrhage.

Post-mortem examination was refused. For the histological examination of the specimen, see Dr. Spiller's report of Case IX.

CASE X. *Removal of the Gasserian ganglion; death from shock in ten hours.*—Mrs. M. S., aged sixty-three years, first consulted me about the middle of October, 1896. She had suffered with neuralgia for over thirty years. A few years ago Dr. W. J. Hearn removed the second and third divisions, with relief for a considerable time. The pain has now returned not only in these two divisions, but also in the first. Unfortunately, the notes of the earlier history were lost by one of my assistants, and these are the only facts which I can give. (Fig. 8.)

FIG. 8.



Gasserian ganglion (A) and second and third divisions (B and C) respectively, from Case X.

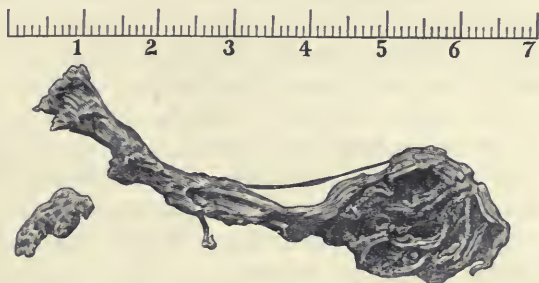
Operation, October 31, 1896. The ordinary osteoplastic flap was turned down. The anterior branch of the middle meningeal divided into three large branches, all running in very deep grooves in the bones, and all were lacerated in turning down the flap. After some little trouble they were secured. The second and third divisions were readily found and traced back to the ganglion. In uncovering the ganglion I met with such profuse hemorrhage that I divided the second and third divisions and endeavored to remove the ganglion by traction instead of seizing the ganglion itself. I decided upon this procedure not so much because of the amount of blood lost, which constantly recurred upon the slightest manipulation in the effort to uncover the ganglion, as because of the amount of time lost. Avulsion of the third division brought a considerable quantity of the ganglion with it. When the second was avulsed no ganglion tissue could be recognized. The ganglion was broken up and wiped away by the small sponges which we used to check the hemorrhage. The operation lasted an hour and a half; the patient's pulse kept up very well, but the respiration was very poor. During the operation three doses of one-twentieth of a grain of strychnine and one one-hundredth of a grain of atropine were administered. In one hour after the operation she seemed to be reacting very nicely. Soon after that, however, she began to fail, and died ten hours after the operation. No post-mortem examination could

be obtained. For a full report of the specimen in this case, see Dr. Spiller's notes of Case X.

CASE XI. *Removal of the Gasserian ganglion after six prior operations; recovery; cure for sixteen months; eyesight lost from secondary corneal ulcer caused by his neglect.*—F. W. P., aged fifty-six years. Neuralgia began six years ago in the right lower jaw. At different times he has had six peripheral operations by Dr. Parmenter, of Buffalo. He has operated on the inferior dental both in the dental canal and finally at the foramen ovale. On November 8, 1895, Dr. Parmenter operated on the Gasserian ganglion, but the pain returned within a month. When I first saw him the conjunctiva and cornea had normal sensibility, as also the skin of the entire face and the tongue.

Operation, January 22, 1897. Owing to the former Hartley-Krause operation, great difficulty was found in turning down the flap on account of adhesions to the dura mater. The anterior branch of the middle meningeal was ligated, as it had been torn during the removal of the flap. Temporary packing and heat were applied, which checked the hemorrhage very readily. The third and, later, the second divisions

FIG. 9.



Gasserian ganglion and second and third divisions, from Case XI. The ganglion is the mass to the right; the left portion is the second division, and the detached mass is the third division.

were then readily found, and later the ganglion laid bare. (Fig. 9.) It was seized with a pair of hæmostatic forceps, and the second and third divisions of the nerve severed at their foramina. The foramen ovale, instead of being oval, was distinctly triangular, and the nerve only partly filled it. The foramen was much larger than I had ever seen it before. The second division tore loose from the ganglion. Removal of the ganglion was followed by moderate hemorrhage. The operation was unusually long, two and a quarter hours, on account of the adhesions to the bone and also the difficulty of determining when I had reached the dura. The eyelids were stitched together at the close of the operation. Thirteen days after the operation he went home, his highest temperature having been 100° F. The stitches were removed on the third day and the eye covered by a Buller shield. When he went home the eye was in good condition and he was beginning to dispense with the shield. Later, through his negligence in covering the eye with a handkerchief without the shield, friction on the cornea produced a corneal ulcer, from which I learned later that he ultimately lost his eyesight. He has been now entirely free from pain for sixteen months. His gen-

eral health is excellent. For a fuller report of the specimen in this case, see Dr. Spiller's notes of Case XI.

To sum up the results of Dr. Spiller's researches, we may say that in a general way the pathological changes which he has found are :

1. That the medullary substance of the nerve fibres within the ganglion and its branches is much swollen, atrophied, or entirely gone, depending on the intensity of the disease.

2. That the axis cylinders similarly are markedly degenerated or entirely destroyed.

3. That the cells of the ganglion itself, in at least one case, are so degenerated or atrophied that there would be even doubts whether we were dealing with ganglionic tissue in certain parts of the field, were it not for the occasional nerve cells seen.

4. That the vessels are very distinctly sclerotic. In some instances the lumen is even entirely obliterated.

5. There is, in at least one case, a decided amount of increase in the connective tissue of the ganglion, which is enough to call the alteration a distinct sclerosis.

I propose now to consider four points :

1. Should the Gasserian ganglion be removed ?

2. The answer being in the affirmative, to what extent shall it be removed—i. e., shall we remove the entire ganglion, or only its outer two-thirds ? or shall we be satisfied with simply " breaking it up " by blunt instruments or a curette ?

3. Should the ganglion be removed as a primary operation, or should its removal be reserved till the very last operation for tic douloureux ?

4. A few points in the technique.

1. The removal of the Gasserian ganglion is in some respects rather peculiarly American. The first deliberate proposal to remove the Gasserian ganglion was made by Dr. J. Ewing Mears, of Philadelphia (*Transactions American Medical Association*, 1884, vol. ii. p. 469). Andrews, of Chicago (*Chicago Medical Record*, 1891, vol. i. p. 322), had been at work for eighteen months devising practically the same operation as Rose, but the latter preceded him both in publication and performance (*Lancet*, 1890, vol. ii. p. 914). Similarly, Hartley, of New York, and Krause, of Altoona, almost at the same time devised the method of operating which has been most used and is, on the whole, perhaps the best method.

Of the 108 cases of intracranial operations on the fifth nerve, collected by Tiffany (*Transactions American Surgical Association*, 1896, vol. xiv. p. 1, and *Annals of Surgery*, 1896, vol. xxiv. p. 575), seventy-nine were done by American surgeons and twenty-nine by European surgeons.

Whether we ought still to resect the ganglion depends, in my opinion,

on three conditions : (a) The mortality of the operation ; (b) its efficiency as a means of permanent cure ; and (c) whether its disadvantages, especially the possibility of the loss of the eye on the operated side, can be avoided.

(a) The mortality of the operation may be taken as that shown by Tiffany's table (108 cases, twenty-four deaths), a mortality of 22.2 per cent. For an operation done by modern antiseptic or aseptic methods, a mortality of over one-fifth is very large. I have no doubt it will be diminished in the future, as we learn by experience to deal with the vicissitudes and emergencies. In fact, surgically speaking, we *must* master and overcome so large a mortality. No one who has ever resected a Gasserian ganglion will speak lightly of the operation. Even now, after having operated on eleven, I always approach the operation with a certain amount of hesitation. The mortality alone would cause me to answer the third question positively in favor of the resection being reserved for the last of the series of operations instead of the first.

(b) What has been the history of the cases as to cure? So far as I know, there have been four cases in which the pain has returned ; one of Rose's, one reported by Dana, and two by myself. But I especially desire to call attention to the fact that my own two cases of recurring pain were my *first two operations* ; that in Case I. no microscopical examination of the fragment removed was made, and in Case II. the examination revealed no ganglionic cells or nerve fibres. As I now look at it, Case I. was imperfectly done, and Case II. still more so. Therefore the recurrence of pain in these two cases cannot be used as an argument against the removal of the ganglion. The facts as to recurrence of pain in these two cases have been given earlier in this paper.

In addition to this, Krause has reported one case in which the sensory root was found diseased, and the pain returned on the other side of the face. We can conclude, therefore, in general, as a result of experience in over one hundred cases of intracranial operation on the fifth nerve that, practically, the pain will return in not over 1 or 2 per cent. with any such severity as to liken it to the original disease, and that it will return to any degree in not more than 4 or 5 per cent. Perhaps, if we consider the uncertainty of total excision of the ganglion in the reported cases in which pain did return, this percentage is too high. As Dr. Spiller has shown, there are only two cases known to him in which the sensory root has been examined (although it may be that Krause examined the sensory root in some of his other cases) ; one of these was by Krause and one by himself. In Krause's case the root was diseased, and the pain returned upon the opposite side. In my own case (Case VI.), though the lesions of the ganglion were very intense, and the disease had existed for five years,

yet Dr. Spiller found the sensory root entirely free in longitudinal as well as transverse sections. We must expect, as a result of both the clinical history and the pathological examination of Krause's case, that the disease may not only reach, but may pass beyond, the ganglion to the sensory root, and that, therefore, even the removal of the ganglion will not always absolutely prevent a return.

(c) Apart from the mortality the chief danger is the loss of vision, if not of the eyeball. This, I think, I now know how to master. I shall consider it under the question of technique. All other disadvantages, such as the possible necrosis of a piece of the bone, the sinking in of the flap, or the possible uselessness in a certain number of cases of the muscles of deglutition, are very slight as compared with the immense relief from the horrible pain. My conclusion, therefore, is that the removal of the Gasserian ganglion should still be done, but that we should especially strive to lessen the mortality of the operation.

2. To what extent shall the ganglion be removed? Tiffany has expressed the opinion (1) that the motor root can be saved, and (2) that it ought to be saved. In some of my cases, though I have made no attempt to save the motor root, the muscles of mastication on the operated side were not wholly paralyzed. In Case VI., in which the motor root was certainly removed, the muscles of mastication on the operated side are atrophied and useless, but the patient can readily masticate meats, the lower jaw being easily moved by the muscles of the opposite side. I do not, however, believe that the motor root can be preserved. In the first place, I do not think that, from an operative point of view, it is possible to do so, and, secondly, the very careful dissection of the ganglion made by Jouvra (Chipault's *Travaux Neurol. Chir.*, 1897, vol. ii. p. 205) makes me sure that this is even anatomically quite impossible. He says (pp. 209-210), "the masticatory nerve [by which I take it he means the motor root] and its branches are very adherent to the trunk of the inferior maxillary division and are contained in the same sheath of connective tissue; the separation of these two nerves is difficult even by the most careful dissection, and to avulse the inferior maxillary without at the same time avulsing the masticatory nerve is veritably impossible." If this cannot be done on the dead body by the most careful dissection, it cannot be done on the living during the exigencies of an operation.

In the microscopical examination of Case VI. the motor root was found to form an intimate part of the third branch so near the ganglion that it would have been very difficult or even impossible to separate it from the ganglion at the time of operation. Another point is worthy of mention; the peripheral sensory branches must degenerate after resection of the ganglion, and it may be that in the sclerosis which follows the destruction of the sensory fibres in the third branch the

motor fibres would be at least partly affected even if they had not been cut. The only possible absolute necessity for preserving the nerve would be the need for preserving it in case of a bilateral resection of the Gasserian ganglion. This has never yet been necessary, and will surely be extremely rare. If, after destruction of the ganglion, the muscles of mastication on the sound side are sufficient for the purposes of mastication, I see no reason to trouble ourselves to preserve the motor root.

A much more important question as to the extent of the removal of the ganglion is whether the entire ganglion shall be avulsed, such, for example, as is seen in Fig. 3 from Case VI. of my own series and in several of Krause's photographs (*Neuralgie des Trigemini*), or whether we should follow the recommendation of Tiffany, that only the outer two-thirds of the ganglion, together with the second and third divisions, should be removed and the inner third left. The only object in leaving the inner third is the conservation of vision. But, as shown below, I believe that our methods of dealing with the eye are so improved that we can positively now remove the ganglion and yet conserve the eye.

In addition to this we must remember that the ganglion is not divided into thirds physically or physiologically. It is not true that the inner third of the ganglion is connected exclusively with the first division and supplies the eye, the middle third with the second division, and the outer third with the third division; but the cells of the ganglion in every part are more or less connected, so far as we know, with any or all of the three divisions.

An arbitrary line, therefore, removing the outer two-thirds and leaving the inner third will leave undoubtedly diseased ganglionic cells if the ganglion is affected. If these cells are diseased, any stimulus from the first division will excite sensation in them, and thus may bring about a return of the pain.

As the only objection to removing the whole ganglion—the effect upon the eye—can now, I think, be overcome, we ought, I believe, distinctly to aim at the removal of the entire ganglion.

3. Shall the ganglion be removed as a primary operation—the very first after the disease has set in—or shall it be left till the last operation?—that is to say, shall we perform as many peripheral operations as can be done first, and only remove the ganglion when we are driven to it?

I believe that this last is the proper position to take.

While Dr. Spiller, from his investigations of the pathology, is not able to say positively whether the ganglion becomes diseased primarily or secondarily, yet, as he points out, the clinical evidence would lead us to believe that the ganglion is the last of all to suffer. Of course, after any peripheral operation, just as after an amputation of an arm, atrophic changes will set in which will go direct to the Gasserian ganglion, and may, so far as we know, reach to the pons, or even possibly

the cortex, just as after an amputation of an arm atrophic changes can be traced into the central nervous system, yet these are very different from anything like an ascending neuritis which would involve the ganglion in inflammatory troubles as a result of the preceding disease of the nerve branches.

The effect on the ganglion, even after eighteen years of suffering, in Case VIII., was very slight. This, so far as I know, is the only examination of a ganglion in which no peripheral operation had been done, and in which the examination is, therefore, free from any suspicions of alteration in the ganglion other than that due to a possible ascending neuritis. It must be stated, however, that the entire ganglion could not be examined microscopically. If the ganglion is not diseased, therefore, primarily I believe that we ought to attack the disease where we know it exists—namely, in the peripheral branches. If the ganglion is primarily diseased, we cannot understand how it is that relief is afforded for one, two, three, or more years by a peripheral operation. The simple shock of the operation would not keep a diseased ganglion quiescent for months or years. My own conviction, based on examinations so far made, is that the disease, in many cases at least, is primarily peripheral and that the ganglion is involved by extension upward. In those cases in which some local growth is found on the branches of the fifth nerve the cause of the pain must, of course, be peripheral, and we have no means of detecting the presence of such a lesion previous to operation. I would, therefore, urge not only that the removal of the Gasserian ganglion should be the *last operation*, but I would specially urge that peripheral operations be done *early*. Most operations for tic douloureux are made two, three, five, ten, or even twenty years after the disease began and after vain attempts have been made to cure by drugs. My own view decidedly is that, if the disease has positively existed for so long a period as three or four months, and if during this time, while drugs may have relieved, they have not *cured* it, I would *wait no longer, but instantly do the peripheral operation in the hope of arresting the peripheral disease and preventing its upward course, which in time will result in its involving the ganglion.*

When we remember the fact that all the peripheral operations are virtually without danger to life, and that they relieve for a considerable time, and that we are in a position now to state that the mortality of Gasserian operations is over 20 per cent., and that in a small percentage of cases even the removal of the Gasserian ganglion *may* not surely and permanently cure, I think we are in a position to say that the removal of the ganglion should not be done till we have exhausted our resources in peripheral operations, or till a larger surgical experience shows that the removal of the entire ganglion will cure permanently and a better surgical technique greatly lessens the present mortality.

4. A few points in technique :

(a) *Access to the cranial cavity.* There is no question in my mind that either the Hartley-Krause operation, or the operation of Doyen (which I have never yet attempted), or an operation somewhat analogous to it, described by Poirier in Chipault's *Travaux de Neurologie Chirurgicale*, 1897, vol. ii. p. 213, is the preferable one. All of these approach the ganglion from the side and by lifting the temporo-sphenoidal lobe. By no possibility can one work with the same advantage either as to light or facility of manipulation by Rose's method. Whether the flap shall be raised by chisel or drill or saw I think is a matter largely of preference of each individual operator.

(b) *Hemorrhage.* In three instances I have done the operation in two stages on account of hemorrhage, packing iodoform gauze into the skull in these cases. The amount of gauze which I have used has surprised me very much. In one case it was 37 by 6 inches, or 222 square inches of gauze ; in a second, 23 by 14 inches, or 322 square inches ; in a third, 267 square inches ; and in a fourth a piece 16 by 6, or 96 square inches. I mention this to show what an amount of pressure the brain will stand, but I also mention it to condemn the procedure if it is possible to avoid it. The danger of infection is always considerable in any case in which the skull cavity has to be reopened. Moreover, I think we ought always to avoid testing the power of the brain to stand pressure, if we can. I join, therefore, heartily with Krause in urging that the operation shall be completed in a single sitting, if possible.

Hemorrhage from the middle meningeal has almost invariably taken place in all of my operations, either by unavoidable tearing of the vessel in turning down the flap, or, as happened three times, by the tearing of the vessel at the foramen spinosum. In the latter case the simple use of the Allis blunt dissector, to block up the vessel for a moment by the curved end, and later the substitution first of the left forefinger and then of a small bit of iodoform gauze, will overcome the difficulty, if the vessel cannot be ligated. On no account, in my opinion, should the external carotid be ligated as a preliminary measure. In one case in this city (Philadelphia) in which it was done, necrosis of the temporal flap took place, and the patient's death from sepsis followed as a result.

(c) *The removal of the ganglion itself* is best done by Krause's method—namely, uncovering the ganglion and then seizing it and twisting it out after dividing the second and third divisions at their foramina. This method of removal should be employed instead of the uncertain method of "breaking up" the ganglion when we act blindly and unscientifically.

(d) *The preservation of the eye.* The method which experience has taught me now definitely to adopt is as follows : Either immediately

before or at the close of the operation I disinfect the eye and sew the two lids together by two or three stitches, near the margins, drawing together only the middle of the lids. This leaves the two ends open sufficiently, first, for washing the space between the lids and the eye-ball with a warm boric-acid solution, to wash away any mucus, and also leaves enough space for us to observe the cornea when the patient looks strongly to one side. This occlusion of the lids should last for not less than four or five days. The stitches may then be cut and the eye immediately covered by a Buller shield—*i. e.*, a watch-glass held in place by means of either a circular fenestrated disk of rubber plaster or by four separate pieces of plaster. I prefer the circular plaster.

The reason for the corneal ulceration and loss of vision or loss of the eye is undoubtedly, first, the drying of the cornea, due to the want of appreciation of its drying and, therefore, to want of winking, by which the cornea is kept moist; and, secondly, as another result of the want of sensitiveness of the cornea, either foreign bodies get into the eye, or, as in one of my cases, a bandage over the eye may rub the cornea and thus produce ulceration and the destruction of the cornea. The use of the Buller shield is so thoroughly satisfactory both in protecting the eye and in keeping it moist that I think any one who has tried it will be unwilling to dispense with it afterward. Its use should be continued for from ten to thirty days after the operation.

PATHOLOGICAL REPORT, BY DR. SPILLER.

(From the Wistar Institute of Anatomy and Biology.)

Little attention has been paid to the microscopical examination of the Gasserian ganglia removed from patients suffering from tic douloureux; indeed, with the exception of a few cases, we have had almost no information furnished us on the pathological condition of these structures in the disease. It was, therefore, with a feeling of deepest interest that I undertook the examination of the ganglia removed by Dr. Keen from seven cases of prosopalgia.

This report is based on a study of several hundred sections. The stains employed have been carmine, hæmatoxylin (Delafield's and Weigert's), osmic acid (methods of Azoulay and of Marchi), thionin, acid fuchsin, and eosin. The method of Rosin has given most satisfactory results for a study of the nerve fibres, and in some cases, in which the material did not stain readily with carmine, Delafield's hæmatoxylin, with an after-stain of acid fuchsin, presented beautifully colored specimens. Unfortunately, the method of Nissl could not be employed, as all the ganglia had been placed in Müller's fluid. The method of Azoulay proved to be of great service, for in some cases in

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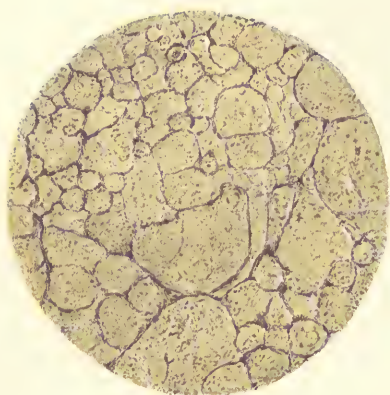


FIG. 11.



FIG. 10.

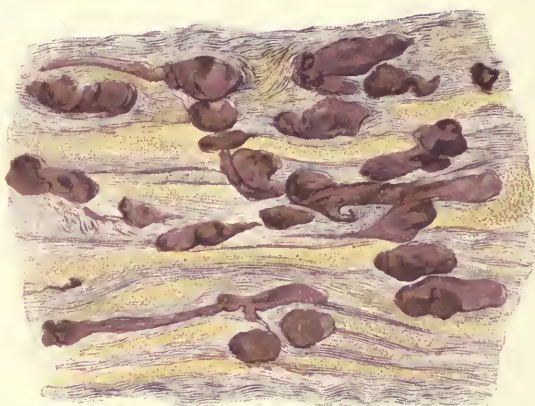


FIG. 12.

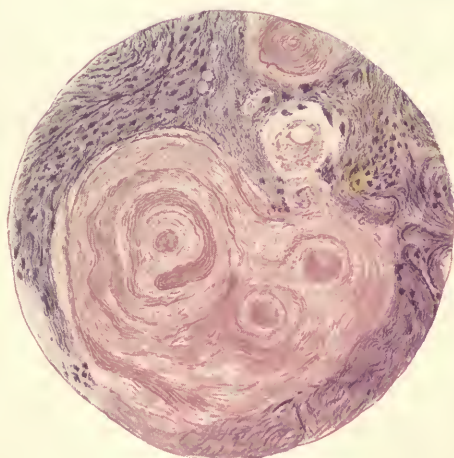


FIG. 13.

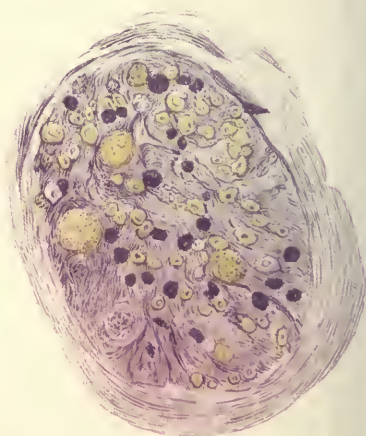


FIG. 14.

which the method of Weigert did not give thoroughly satisfactory results, the former yielded sections well stained.

CASE V.—The nerve fibres are greatly altered ; in many the medullary sheaths are much swollen, and no traces of axis cylinders can be seen ; in others the latter are represented by irregular and separate masses of a hyaline-like red substance, which have little resemblance to normal axis cylinders. Many nerve sheaths are entirely empty. The vessels are sclerotic, and some of the smaller ones are entirely closed. The ganglion cells are in different stages of degeneration ; some are faintly stained and have very indistinct outlines, and there are numerous spaces in which the cells have entirely disappeared. Some of the nerve cells are very small and without nuclei and nucleoli, though possibly this may be due to the fact that superficial portions of these cells were obtained in the sections, and the connective tissue between them is increased in amount. The pericellular spaces seem to be somewhat larger than in normal ganglia, and appear as if the cells had shrunk away from their capsules. No very great difference can be noticed in the condition of the second and third branches of the nerve, for they seem to be nearly equally diseased.

CASE VI.—The ganglion removed from Case VI. presents, on microscopical examination, most distinct evidences of degeneration. The medullary sheaths of many of the intraganglionic fibres are greatly swollen, and the fibres have an irregular, beaded appearance in longitudinal sections. (Fig. 10.) Some bundles, cut transversely, contain masses of medullary substance varying greatly in size and of most irregular form, and without a trace of axis cylinders. Stained by the method of Azoulay or Weigert, these masses of medullary substance stand out prominently, and it is noticed that frequently they are not continuous with one another, but that they are connected by empty and contracted nerve sheaths. There is no great increase in the number of the nuclei of the sheaths of Schwann. Normal bundles of fibres are found lying close to fibres very greatly degenerated. It is impossible to find any greater alteration of the fibres belonging to the second than of those belonging to the third branch of the trifacial nerve.

DESCRIPTION OF PLATES.

FIG. 10. Portion of the Gasserian ganglion at the entrance of the third branch of the trifacial nerve, from Case VI. The medullary sheaths are most irregularly swollen, and at the right of the field empty nerve sheaths are seen (method of Azoulay).

FIG. 11. Portion of the second branch of the trigeminal nerve near the Gasserian ganglion, from Case VI. The axis cylinders have entirely disappeared, and the medullary sheaths are greatly swollen. In many places the medullary substance of two or more nerve fibres has united into irregularly shaped masses.

FIG. 12. One of the nerve bundles within the Gasserian ganglion, from Case VI. Numerous swollen and irregularly formed axis cylinders may be seen. In most portions of the field these appear as drops of a red, hyaline-like substance, but in one portion an axis cylinder of considerable length may be seen.

FIG. 13. Bloodvessels from the Gasserian ganglion in Case IX. The walls are greatly thickened, and the lumen of the large vessel has been almost entirely obliterated. In one place the innermost layers of the vessel have contracted from the outer during the process of hardening. Smaller vessels in the upper part of the field are entirely closed.

FIG. 14. A nerve bundle of the trigeminus close to the Gasserian ganglion, from Case X. Only a few nerve fibres are present, and everywhere an abundance of connective tissue is seen. Three much swollen medullary sheaths are in the field.

The sensory and motor roots are normal; the nerve fibres in these roots present medullary sheaths which stain well and have normal outlines. Longitudinal and transverse sections of the motor and sensory roots, and of the second and third branches of the nerve, have been obtained; the first branch had been broken off close to the ganglion at the time of the operation.

Transverse sections of the motor and sensory roots present the usual number of nerve fibres, each with an axis cylinder surrounded by a medullary sheath and separated from the other by a moderate amount of connective tissue. The contrast afforded by the transverse sections of the second and third branches with those of the sensory and motor roots is most striking. In the second branch, especially, the irregular and large masses of medullary substance are very distinct (Fig. 11), and in many bundles it is impossible to detect axis cylinders. Atrophied fibres seem to predominate in the transverse sections of the third branch, though in longitudinal sections a little nearer the ganglion the swollen medullary sheaths are as visible as in the second branch. The ganglion was cut longitudinally in such a manner that its relation to the second and third branches and the sensory root are shown in a single section. In some intraganglionic nerve bundles axis cylinders may be found greatly swollen and occurring in irregular masses of a pinkish hue when the carmine is employed as stain, but these masses are more numerous in certain bundles. (Fig. 12.) The process has evidently reached a stage in which the swollen axis cylinders have in large part been removed. The connective tissue about and between the bundles of nerve fibres is not very excessive, but is increased to some extent between the individual fibres.

The ganglion cells are somewhat more irregular in outline, the smaller cells are more numerous, and the pericellular spaces are larger than in normal ganglia. Many cells contain vacuoles, but the nuclei are not eccentric and the nucleolus can usually be seen. The pigmentation of the cells is not excessive, and the capsules of the cells do not appear to be much thickened, nor are their nuclei unusually numerous. The intercellular tissue is not notably increased. In some places the cells are very small and faintly stained, though a few appear unusually large and swollen, but these are comparatively rare. The most striking alteration of the cells is the atrophy with the enlargement of the pericellular spaces, of which the latter may be due to changes which have occurred after removal of the ganglion.

The small vessels in many parts of the ganglion are greatly altered; some are completely closed by the proliferation of the tissue in the walls of the vessels, while others show only a slight alteration.

CASE VII.—The ganglion cells are most irregular in shape, and appear to be somewhat more separated than normally from one another by overgrowth of the intercellular connective tissue. Some of the cells are not sharply defined from the surrounding tissue, and some do not contain distinct nuclei or nucleoli. In some places the ganglion cells have been destroyed and removed; in others the cells contain much pigment and some vacuoles. The cellular changes are greater than in the preceding case, in which they are not especially striking. The medullary sheaths of the nerve fibres in many places are greatly swollen. Many nerve bundles contain very small nerve fibres; many are entirely deprived of nerve fibres and contain merely connective tissue; and

many contain swollen medullary sheaths without axis cylinders. The small vessels have thickened walls, and some are entirely closed by proliferated tissue.

CASE VIII.—Some of the vessels are sclerotic, but there is little change in the nerve fibres. The smaller ganglion cells are abnormally abundant. In some places the medullary sheaths are somewhat swollen.

CASE IX.—The findings in this case consist of swollen medullary sheaths, diseased axis cylinders, proliferated connective tissue in the nerve bundles, with destruction of nerve fibres, and altered ganglion cells. Only a portion of the ganglion has been obtained, but it is sufficient for the purposes of microscopical study. The cells and their capsules in certain parts can be distinguished with difficulty from the surrounding tissue; in other parts they are much more distinct; it is frequently impossible to detect nuclei or nucleoli, and one might well doubt whether he were examining ganglionic tissue were it not for the fact that here and there a nerve cell is detected. The intercellular tissue has replaced the ganglion cells.

The bloodvessels are much altered, as may be seen in Fig. 13. In the vessel represented here the media and intima are much thickened, and the latter has almost entirely filled the lumen of the vessel, leaving several smaller passages for the current of blood. In the process of hardening the inner coats at one portion have contracted and withdrawn from the outer, leaving an open space.

CASE X.—The medullary sheaths in certain parts of the sections are greatly swollen, and the axis cylinders have been almost entirely destroyed (Fig. 14) and removed, leaving small lumps of pinkish hyaline substance here and there. Many nerve sheaths may be found in which the medullary substance and axis cylinders have entirely disappeared. The vessels seem to be less affected than in the other cases in which evidences of intense degeneration have been noted. The ganglion cells have indistinct outlines, and some stain very faintly. The intercellular tissue is increased in amount, and throughout the sections in which the ganglion cells are found numerous granular corpuscles are noticed.

CASE XI.—The ganglion cells are vacuolated, but do not appear to be greatly altered, nor are the cell capsules notably thickened. In one portion of certain sections nerve bundles are found in a high degree of degeneration; the medullary sheaths have almost entirely disappeared, leaving only granular masses here and there; the axis cylinders are swollen, and the connective tissue and empty nerve sheaths occupy a large portion of the fields. The vessels are somewhat altered.

In six of the cases just described the lesions are of an intense degree and unquestionable. In a seventh case (Case VIII.) they are much less distinct.

The lesions in the Gasserian ganglion in the more advanced cases of tic douloureux consist of much-swollen medullary sheaths, swollen axis cylinders, atrophied fibres, empty nerve sheaths, nerve bundles in which the nerve elements have been destroyed and only connective tissue is left, atrophied ganglion cells, cells faintly stained, and sclerosed blood-

vessels, in some cases even without a lumen. In all the specimens examined numerous red blood-corpuscles are observed, which doubtless owe their position within the tissues to the surgical interference.

The pathology of tic douloureux has not been well known. Some have held that it is a neurosis; others that it is a neuralgia, though this distinction is not very clear; and still others that it is a neuritis. Some have believed that the disease is a peripheral one, and others that the primary lesion is within the ganglion. There is always a possibility that in some cases the lesion may be a central one.

Putnam¹ says that, as a rule, neuritis is present in trifacial neuralgia, and probably exists far oftener than we think. This seems to me exceedingly probable, for the dividing line between neuralgia and neuritis cannot be sharply drawn. One, we are told, is a functional, the other an organic process; but "functional" is a very comprehensive term. Putnam states that of late years physicians have been more favorable to the view that, in chronic forms of neuralgia, at least, the pain is simply the expression of the inflammation of a nerve.

Dana² placed much more value on the condition of the bloodvessels than on inflammatory changes in the nerve fibres.

In a recent communication to the writer he expresses the opinion that trifacial neuralgia is due to degenerative neuritis of the peripheral sensory neurons of the fifth nerve, depending on or associated with obliterating arteritis.

The investigations by Thoma³ of the bloodvessels from the painful area in supra-orbital neuralgia, and his explanation for their sclerotic condition, are most interesting.

Rose⁴ also has remarked on the size of the vessels and the thickness of their walls in some of the cases on which he operated. He found great alteration of the peripheral nerves in trifacial neuralgia. The appearances were those of chronic neuritis, and were often more marked at the peripheral than at the central end of the nerves.

Microscopical alterations of the peripheral branches of the fifth nerve in cases of tic douloureux have also been noticed by Tuffier,⁵ De Schweinitz,⁶ Horsley,⁷ Tripier,⁸ Putnam,⁹ Krause,¹⁰ Spiller,¹¹ and

¹ Putnam: Boston Medical and Surgical Journal, 1891, vol. ii. pp. 157, 186.

² Dana: Medical News, May 16, 1891.

³ Thoma: Deutsches Archiv für klinische Medizin, 1888, vol. lxxiii. p. 409.

⁴ Rose: Transactions of the Medical Society of London, 1892, vol. xv. p. 157.

⁵ Tuffier: La France médicale, 1881, vol. i. p. 672.

⁶ De Schweinitz: In paper by Mears, Transactions of the American Surgical Association, 1885, vol. ii. p. 469.

⁷ Horsley: Transactions Odontological Society, 1887, vol. xix. p. 270. Cited by Rose.

⁸ Tripier: Revue de Chirurgie, 1889, vol. ix. p. 453.

⁹ Putnam: Boston Medical and Surgical Journal, 1892, vol. ii. pp. 157, 186.

¹⁰ Krause: Die Neuralgie des Trigemini, Leipzig, 1896.

¹¹ Spiller: Journal of Nervous and Mental Disease, June, 1893, p. 400. (In a paper by J. K. Mitchell.)

others, and macroscopical changes have been detected by Tuffier,¹ Mears,² Tripiet,³ Keen,⁴ and others.

Krause's⁵ book is the most thorough which has as yet appeared on trifacial neuralgia. Though he found alterations in branches of the fifth nerve which had been slowly twisted out, he was unable to detect changes in the vessels. Krause observed marked lesions in the Gasserian ganglion in cases of tic douloureux, but only in one case could he demonstrate changes in the sensory fifth root, and in this case after the pain had disappeared on one side of the face, as a result of excision of the ganglion, it recurred on the other.

Krause could not find the sclerosis of the ganglion which other writers describe, and which certainly exists in one of Dr. Keen's cases (Case IX.).

In six of Krause's seven cases resection of the nerves had preceded by some years the excision of the ganglion, and he justly compares his findings with those seen after amputation, but he regards them as too intense to be merely secondary. He thinks the question cannot be positively settled until a ganglion is examined the peripheral nerves of which have never been resected. This examination has been made in Case VIII. of this paper. In none of Krause's cases did the neuralgia return after excision of the ganglion, even within three and a half years after the operation, and as the peripheral operations did not give permanent relief, and extirpation of the ganglion did do so, he thinks it is allowable to conclude that the cause is to be sought in the Gasserian ganglion.

It seems to me quite possible that the trouble may first be peripheral, and as resection gives only temporary relief, the recurrence of the pain may be due to extension of the morbid process to the ganglion.

Krause is disposed to regard the changes in the ganglion partly as primary and partly as secondary from the resection.

The fact that nerve degeneration may extend beyond the spinal ganglia and affect the posterior roots must make us prepared for the possibility of an extension of a similar process after extirpation of the Gasserian ganglion.

Other investigators who have found lesions of the Gasserian ganglion are Wedl, Rose, Podrazky and Lavéran, Horsley, Putnam, and Antonino d'Antona (all cited by Krause).

The possibility of the changes in the ganglion being secondary, as Krause suggests, is not to be lightly passed over. Lugaro⁶ has shown

¹ Tuffier: *La France médicale*, 1881, vol. i. p. 672.

² Mears: *Transactions of the American Surgical Association*, 1885, vol. ii. p. 469.

³ Tripiet. *Revue de Chirurgie*, 1889, vol. ix. p. 453.

⁴ Keen: *THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES*, 1896, vol. i.

⁵ Krause: *Die Neuralgie des Trigemini*. Leipzig, 1896.

⁶ Lugaro: *Rivista di Patologia nervosa e mentale*, 1896. Cited by Schaffer in *Monatsschrift für Psychiatrie und Neurologie*, July, 1897.

that the nerve cells of the spinal ganglia undergo marked alteration after lesions of the peripheral fibres, and the spinal ganglia are so similar to the Gasserian that the results of these experiments may be applied to the latter.

Fleming has noticed that the cells of the ganglia on the posterior nerve roots in rabbits and dogs undergo definite changes as the result of nerve section or of ligature, and do so at a much earlier period than do the multipolar cells in the cord, beginning probably as early as the fourth day, and certainly by the seventh day. The nucleus, and sometimes the nucleolus also, become small, and the nucleus may be excentric and even bulge the cell wall. The chromophilic granules are altered, the cells atrophy, and the pericellular lymph spaces become enlarged. Just here we may mention, however, that Lanhossék's¹ recent studies on fresh spinal ganglia, obtained from an executed man, have taught us that when the ganglia are properly hardened such pericellular lymph spaces do not exist. Fleming² also says that large vacuoles are found in some cells. He thinks it is quite comprehensible that the cells of the ganglia should suffer before the cells of the anterior horns, inasmuch as nerve impulses pass normally to them from the site of the lesion.

Kowalewsky³ cut the sciatic nerve in animals, and injected a few drops of a 5 per cent. chromic acid solution into the central end. The animals were killed two to four days later, and the chromophilic bodies of the cells of the spinal ganglia were found much altered.

If, therefore, such alterations of the ganglion cells occur within a few days after resection of the nerve we may expect greater changes when the time which has elapsed since the operation is reckoned by years instead of days. And yet it is probable that some of the lesions of the ganglion cells which have been described are only of a temporary character.

Neuritis may ascend; it seems that the possibility of this, though often disputed, must be acknowledged. Mlle. de Majewska⁴ has recently written a thesis on the subject. She states that the lesions of ascending neuritis are the same as those of ordinary peripheral neuritis; viz., fragmentation of the myelin, multiplication of the nuclei, and alteration of the axis cylinders. There is no reason why this neuritis should not extend to the cells of the Gasserian ganglion.

It is well, of course, to examine an entire Gasserian ganglion in a case in which resection had never been performed, but the examination of the motor root in a case in which the third branch of the fifth nerve

¹ Lanhossék : *Archiv für Psychiatrie*, vol. xxix. No. 2.

² Fleming : *Brain*, parts lxxvii. and lxxviii.

³ Kowalewsky : *Abstract in Monatschrift für Psychiatrie und Neurologie*, vol. ii. No. 2, p. 147.

⁴ Mlle. de Majewska : *Abstract in Revue Neurologique*, 1897, No. 15.

had been resected in the portion which contains this root, would also be of value, if done some years after the operation. Should no degeneration of the motor root be found there would be some evidence that the ascending degeneration had not been important, for this ascending degeneration is not limited to sensory fibres.

Krause could demonstrate changes in the sensory fifth root only in one case. In Case VI., which I have examined, the sensory root is perfectly normal. The cells of the Gasserian ganglion have each a single axis cylinder, which, at a short distance from the cell body, divides, and one branch passes centrally and the other peripherally. If, therefore, the lesion is primarily within the ganglion cells, we cannot understand why only the peripheral branches of the axis cylinders are diseased, while the central branches remain normal. The same objection has been raised against the ganglionic theory for the commencement of tabes in the spinal ganglia, only in the latter case the central branches of the axis cylinders are diseased and the peripheral, as a rule, are intact.

The great and durable improvement occurring in many cases of trifacial neuralgia after removal of the Gasserian ganglion would seem to indicate that the cause of the suffering is to be sought, at least in many cases, in the Gasserian ganglion; but it by no means follows that we may expect to find lesions of the ganglion in every case, any more than we may hope to find lesions of the spinal ganglia in every case of tabes in which there has been pain, unless the employment of the method of Nissl changes our views, which Schaffer's¹ recent studies make improbable.

We know that a lesion within the cerebrum may produce intense pain, as Edinger,² Biernacki,³ and Kirchhoff⁴ have shown, and Gowers⁵ states that in a case known to him irritation of the sensory nucleus of the fifth nerve in the pons seemed to be the cause of the suffering in the face. Indeed, Gowers says distinctly that we know nothing of the sensory function of the posterior ganglia, and are justified in looking to the nerve cells within the cerebro-spinal axis as the seat of the morbid process.

In a case of trifacial neuralgia, therefore, attention should be directed not only to the condition of the Gasserian ganglion, but also, if possible, to that of the sensory nucleus of the fifth nerve, and to the spinal root of this nerve—*i. e.*, the descending branch.

We must acknowledge, it seems to me, that pain is not the usual manifestation of a lesion confined to the brain or cord, and, indeed, the

¹ Schaffer: Neurologisches Centralblatt, 1893.

² Edinger: Deutsche Zeitschrift für Nervenheilkunde, 1891, vol. 1.

³ Biernacki: Deutsche med. Wochenschrift, 1893, No. 52, p. 1372.

⁴ Kirchhoff: Archiv für Psychiatrie, vol. xxix, No. 3.

⁵ Gowers: A Manual of Diseases of the Nervous System, vol. ii. p. 803. English edition.

presence of pain in cases of suspected hæmatomyelia leads one to diagnosticate hæmatorrhachis. We do not, as a rule, find pain in chronic degenerative processes of the cord which respect the posterior roots and meninges, as, for instance, in syringomyelia, but we find it as an early symptom of tabes, which is also a chronic process, but one which affects the posterior roots.

As Gowers states, vascular dilatation attends functional activity, and it is probably also true that vascular dilatation, if not excessive and too prolonged, causes functional activity. Excessive functional activity of sensory cells may be manifested as pain, but it is possibly equally true that diminution or imperfect quality of the blood-supply may be a cause of pain. How can we better explain the frequent headache of anæmia? If, therefore, we find alteration of the bloodvessels within the ganglia, we may with reasonable suspicion look upon the condition, in part at least, as the cause of the pain, and may believe that peripheral irritation which under normal conditions would not be perceived would be sufficient to produce painful sensation.

As yet, as far as I am able to judge from my researches in the literature, the Gasserian ganglion excised from a case of trifacial neuralgia has never been examined by the method of Nissl.

This method is so important for a study of degenerative changes in nerve cells that no one can say that such changes are absent until he has used the method. Nissl¹ teaches that the employment of the older methods of technique, especially the hardening of the tissue in the chromic salts and the staining with carmine, are not only unsuitable, but likely to be most misleading, a view which most neuropathologists accept.

I am unable, therefore, from a study of these seven cases and from an examination of the literature, to state whether the lesions of the ganglia are primary or secondary, and, if secondary, whether of the nature of ascending neuritis or not. The possibility of the secondary nature of the process within the ganglia in some cases, it seems to me, should not be overlooked. I base the opinion of a possible peripheral involvement, in certain cases, chiefly on the clinical evidence afforded by the relief of pain during two or more years in some patients by nerve resection, though, unfortunately, such cases are in the minority; on the normal condition of the sensory root in Case VI., and on the examination of Case VIII. of this paper, in which the lesions are very slight in comparison with those in the other cases, though the pain had existed for eighteen years. It is true that only a part of the ganglion was obtained in this case, and it is possible that this portion was the least diseased, but it is remarkable that in all the other cases intense

¹ Nissl: *Allgemeine Zeitschrift für Psychiatrie*, vol. liv. Nos. 1 and 2, pp. 26-27.

alteration was found, and in some of these the parts of the ganglia obtained were not larger than in Case VIII.

Case VIII. is the only one of the seven in which a primary resection of the peripheral branches was not done. The pain involved all three branches of the fifth nerve, and Professor Keen therefore attacked the ganglion at once. The possibility of an ascending neuritis in this case, due to nerve resection, is excluded, inasmuch as no operation on the peripheral branches had been performed.

The clinical evidence is of importance, for an absence of pain for two or three years seems to indicate that during the respite the ganglion cannot be greatly diseased. No branch of the fifth nerve is sharply limited to any one portion of the Gasserian ganglion, and were the ganglion primarily diseased the resection of one branch would not remove the peripheral irritation transmitted by the other branches to the hypersensitive cells.

There can be no doubt that intense alteration of a chronic inflammatory character may be found in the Gasserian ganglion in certain cases of *tic douloureux*, and also that the sensory root may be intact. This, it seems to me, is a satisfactory explanation for the relief of pain experienced by many patients in whom the ganglia have been excised.

The removal of the diseased cells within the Gasserian ganglion, which are capable of responding abnormally to every peripheral irritation, may well be attended with the relief of pain. Excision of the ganglion destroys at once the paths of painful sensation from a large area.

The integrity of the sensory root, in the case in which the whole ganglion was removed by Professor Keen, is a fact of considerable importance. It teaches that though the ganglion may be greatly diseased, the process may be arrested at this point. In the other case in which the sensory root was examined—the only other case (Krause) with such an examination which seems to have been reported, though possibly Krause examined the sensory roots of some of the other ganglia, and if so, he probably found them normal—the fibres were found diseased, and the process extended to the other side of the face. This report, and the four cases (one reported by Rose, two by Keen, and one by Dana) in which the pain returned after removal of the ganglion, though we are not sure that all portions of the ganglia were excised in these cases, must make us prepared for the possibility of a renewal of the suffering in some instances, even after the excision of the Gasserian ganglion.

I feel more than ever inclined to believe, from a study of these cases, that neuralgia cannot be sharply distinguished from neuritis, and in some cases of so-called chronic neuralgia, such as obstinate sciatica, I believe we may frequently be able by the microscope to detect evidences of chronic inflammation. At the same time we should not forget that neuritis may assume different clinical forms.

If it could be shown that the sensory root of the Gasserian ganglion does not unite after its fibres are divided, we should have a fact of great importance. Division of this root would probably be a less serious operation than the removal of the entire ganglion, and might have the same effect in the relief of pain, but the surgical difficulties might be insurmountable. Experiments on animals to determine whether or not the sensory root of the Gasserian ganglion unites after section of its fibres might result in a lessening of the great mortality now existing in operations on the ganglion.

THE CAUSES AND CONDITIONS OF PULMONARY TUBERCULOSIS, AND HOW TO AVOID THEM.¹

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THAT instinct which prompts us to regard all men mortal but ourselves has, doubtless, its salutary influence in that it conduces to a more placid endurance of the "chances and changes of this mortal life." On the other hand, however, it is likely to beget in us a carelessness in regard to many of the avoidable dangers to life, particularly when these dangers are ever present with us, breeding a dangerous contempt from our constant familiarity with them. It is always useful, and in season then, to cry "memento mori" with regard to any of the great and constantly present risks to human life, with the hope that we may become more keenly conscious of them, and incited to employ any and all precautions against them. Prevention is always more satisfactory than cure, and the attempt more inspiring. In it the physician exhibits the highest aim and ideal of his unselfish art. From a mercenary point of view, moreover, the cost of prevention is far below that of attempts at cure.

One and probably the greatest danger which threatens human life at the present time is pulmonary tuberculosis; either directly or indirectly it touches the life of almost every individual; one-half of the human race suffer from it, and its ravages are as wide as the habitable world. The mortality from it approaches that of smallpox a hundred years ago, causing from one-fifth to one-seventh of all the deaths—"more than smallpox, diphtheria, scarlatina, typhoid fever, typhus fever, yellow fever, cerebro-spinal fever, Asiatic cholera, relapsing fever, leprosy, measles, and whooping-cough combined."² Moreover,

¹ An essay to which was awarded the "Pray" prize for 1897 of the New Hampshire Medical Society for "the best original essay upon some medical topic."

² Bergy: "Bovine Tuberculosis," etc. Medical News, January 23, 1897.

its greatest number of victims is among the very young and those in the prime of life. Holsti¹ has shown that the mortality is greatest during the first two years of life; the least from the ages of five to fifteen; and then it rises steadily until between thirty-one and forty years. Those whom it does not destroy it incapacitates for labor. We know now that consumption is curable, but at the best only a comparatively small per cent. are cured or permanently arrested, and those generally in the incipient stages and under the most favorable hygienic and climatic conditions. That we shall ever be able to cure any large number of cases by antitubercle serum seems to me problematic, for when the disease is once thoroughly established the infection becomes a mixed one, and various other micro-organisms are brought into play, and the whole system becomes involved. How early in the disease this happens we know not; but often, I believe, before the patient or his physician suspects or has detected the original bacillary infection.

From every point of view, then, the most hopeful outlook in combating this disease is by prevention, and in order to work effectively in this direction one must be familiar with the causes and conditions which lead up to it. To produce a case of pulmonary tuberculosis two factors are always essential: the bacillus and a favorable soil. All of us, especially in the city, are repeatedly exposed, I doubt not, to the tubercle bacillus, and yet those only are infected who present favorable conditions for the development of the germ. On the other hand, no matter how susceptible the individual or how small the "resistance potential," how unfavorable the climate or hygienic conditions may be, if the specific micro-organism is absent, tuberculosis is impossible. Brehmer,² who wrote many years before Koch's discovery of the tubercle bacillus, gives an interesting account of the inhabitants of Iceland, among whom pulmonary tuberculosis did not then exist. These people, he says, lived under the most unfavorable and unhygienic conditions. The winter was long and dreary, the sky cloudy, and the atmosphere filled with dampness. Their dwellings were small, dirty, dark, and unventilated, each person having scarcely ninety-nine cubic feet of air to breathe. These abodes were filled with foul-smelling vapor, arising from the débris of fish lying about the door, and the smoke from dried dung which constituted their fuel. Their food consisted mainly of dried fish which had begun to putrefy, a preparation of milk, called "sky," large quantities of rancid butter, and sour whey mixed with water; they also drank large quantities of alcohol. Their occupation was one of exposure in fishing, bird hunting, and sheep- and cattle-herding. Their feet were constantly wet. In spite of this extraordinarily unwholesome and pernicious condition of existence, no case of pulmonary tuberculosis

¹ Annual of Universal Medical Sciences. Sajous, 1894.

² Die Chronische Lungenschwindsucht und Tuberculose der Lunge, 1869.

existed. In seeking an explanation for this absence, Brehmer suggests the ingenious theory of a physiological augmentation of the circulation, with the resulting increased metabolism, and, perhaps, increased development of body heat produced by the use of an enormous quantity of fat, daily use of whey, and the extreme physical exertion incident to their occupation. The true explanation, of course, was that the tubercle bacilli have never been carried there. Whenever any of the Icelanders migrated to the mainland of Denmark, phthisis was extraordinarily frequent among them, as one would expect, for then occurred the union of the favorable soil from Iceland with the bacillus existing in Denmark.

Dr. Frederick A. Cook,¹ who accompanied Lieutenant Peary's Arctic Expedition, says that the Esquimaux of South Greenland are subject to tuberculosis in great numbers; and he estimates that two-thirds of the inhabitants suffer from some form of this disease. In the Arctic highlands, however, where Peary wintered, no case of tuberculosis was found. Also, upon the shores of Northwest Greenland, Dr. Cook found a small tribe of Esquimaux completely isolated on all sides by the glaciers and through a superstitious belief that the interior was inhabited by men and animals of gigantic size, and among these people tuberculosis had never been observed. Probably similar hygienic and climatic conditions existed in both cases; but the bacillus had been carried to South Greenland and had not reached the other localities.

To prevent tuberculosis, then, we must lead our efforts in two directions, that of eliminating the bacillus and that of establishing an immunity from it by promoting a normal standard of health. That we shall ever succeed in exterminating the elusive and ubiquitous bacillus appears now to be a chimerical fancy; but proof is already at hand that its wanderings can be restrained and its baleful influence curtailed. Italy, by methods of prevention,² reduced the mortality from this disease in less than a century from that of a most virulent epidemic to a comparatively rare disease; and England, by establishing special hospitals for its treatment and the consequent isolation of its tuberculous poor, reduced its mortality 50 per cent. in forty years; Philadelphia has reduced the mortality about 20 per cent. in eight years; and in New York City it has been reduced more than 30 per cent. in twelve years.

The specific germ—the tubercle bacillus—comes from tuberculous individuals, from the milk of tuberculous cows, from the flesh of infected cattle, and, in rare cases, from other domestic animals. Chiefly, however, the source of the germ is from tuberculous man, and from the dried sputum. The bacillus gains entrance into the body through the

¹ *Revue de la Tuberculose*, 2, 1894, p. 376.

² Flick: "Practical Measures for the Prevention of Tuberculosis." *The Medical Record*, October 21, 1893.

mucous membrane of the respiratory and digestive tracts, and by the skin. By far the most common entrance is through the respiratory tract, the bacillus being held in suspension in the air and entering the lungs through respiration. Congenital tuberculosis—direct transmission from mother to child—is possible, but so rare that it can be disregarded. It may be possible, also, that the bacillus may be conveyed directly by the breath; but in most, if not all, of the cases in which this appears to take place, the true source is probably the dried sputum. Tubercle bacilli exist wherever consumption exists, and are constantly being added to through the carelessness, ignorance, and helplessness of the consumptive. They are found in the dust of our streets; consider the enormous amount of expectoration constantly going on there, a certain proportion of which is tuberculous. On one side of a city street I counted 193 expectorations in less than an eighth of a mile; in another locality where fewer people pass I counted 211 in rather more than that distance. They are in our workshops and factories; in stores, banks, halls, hotels, school-houses, churches, theatres, street and steam cars, steamboats, and innumerable private residences. Wherever people congregate there are sure to be some persons, who, suffering from pulmonary tuberculosis, expectorate upon the floor, down radiators, upon their handkerchiefs, and in various places where the sputum will dry and set free the infecting germ.

The bacillus thrives especially in dark, damp localities, overcrowded and ill-ventilated rooms and halls; in tenement-house districts, where the air spaces are small, sunlight scarce, and ventilation poor. The bacillus is a very wily germ, and secretes himself in dark nooks and crannies for almost an indefinite period, until some disturbance, like the removal of a dusty garment or a piece of furniture or hanging, or sweeping, floats him in the air, where he is ready to infect the first person who approaches his vicinity presenting a favorable soil.

In investigating the etiology of the disease it is a frequent experience, especially among the poor classes, to obtain a history of intimate contact, often extending over months, with some other consumptive. It may be as caretaker, room-mate, fellow-worker in shop or factory, or wife, husband, brother, sister, or friend. Or, if not in contact with the consumptive himself, we may find that our patient has occupied a room where a consumptive has lived or died, and disinfection has been neglected or imperfectly performed. In all such cases the presumption is strong that direct infection took place through the bacilli scattered by the previous consumptive or the one intimately associated with.

Dust in unclean localities, in the streets of cities, in tenement-houses, on the wares of the fruit-vender's booth, upon the garments of second-hand clothes dealers, on the plush-covered seats of cars or the bedding of a sleeping-car, on the furniture and hangings of a room occupied

by a consumptive, is always to be regarded as a possible source of tuberculosis. Says a writer,¹ "It would be difficult to conceive of a conjunction of circumstances more directly contributive to disseminate this disease, tuberculosis, than is offered in the palace-car." Let us take some illustrations of the foregoing statements: Prausnitz² inoculated guinea-pigs with scrapings obtained from railway coaches on the line from Berlin to Meran (a line much used by consumptives), and found that the scrapings from five coaches contained virulent tubercle bacilli. Petri³ has also proved the presence of tubercle bacilli in the dust of railway wagons. Dr. Hance⁴ examined the dust collected from street-cars, and proved the presence of tubercle bacilli by the inoculation of guinea-pigs. One in five cars examined was found dangerous to the health of the travelling public.

Schuirer,⁵ on rinsing the dust from some grapes which had been lying in a room looking out upon a narrow street where consumptives congregated to attend a clinic, noticed that the water was quite dirty. Injecting ten cubic centimetres of it into the peritoneal cavity of three guinea-pigs he obtained the following results: One died of peritonitis in two days; the other two lived forty-five and forty-eight days respectively. Post-mortem examination revealed tuberculosis originating at the site of inoculation and involving the peritoneum, liver, and spleen, with small deposits in the lungs. Microscopical examination revealed numerous tubercle bacilli.

Kirchner⁶ narrates the following fact: Three sergeants of a Prussian regiment employed in a portion of a warehouse containing clothing and military goods, successively contracted tuberculosis, from which all three died. Kirchner collected six specimens of the dust found upon the various articles of military clothing kept in the part of the warehouse where the sergeants were employed, and inoculated six rabbits with it, but with negative results. On repeating the test, however, with six more rabbits he obtained the following results: Three rabbits died of tuberculosis of the peritoneum in eighty-four, one hundred and one, and one hundred and eight days after the inoculation; two died of sepsis, and one remained alive, but his autopsy later showed no tuberculosis. He concludes from these experiments that the three soldiers contracted tuberculosis from the bacilliferous dust upon the clothing.

Of 311 animals inoculated with dust from rooms occupied by phthisical patients by Cornet,⁷ 167 died soon after infection; 59—*i. e.*, one-

¹ Sajous' Annual, 1890.

² Quoted in Sajous' Annual of Universal Medical Sciences for 1892.

³ *Revue de la Tuberculose*, ii. 1894.

⁴ "A Further Study of Tubercular Dust," read at the New York Academy of Medicine, January 21, 1897.

⁵ Sajous' Annual, 1892.

⁶ *Revue de la Tuberculose*, 1896, No. 2, p. 142.

⁷ Annual of Universal Medical Sciences. Sajous, 1889.

fifth of the whole number—were found tuberculous, and 85 were healthy. A room in a hotel occupied for six weeks by a phthisical actress, and a workshop occupied by a tailor who had directly communicated the disease to a fellow worker, were found infectious. But in no case was the dust of the walls infectious when sputum-cups were used exclusively to receive the expectorated matter. The same negative results were also obtained in the City of London Hospital for Diseases of the Chest, the Adirondack Cottage Sanitarium, and the Winyah, at Asheville, by Drs. Heron, Hance, and Von Ruck, proper disposal of the sputum being made in all of these institutions.

Kirchner¹ also has shown by a series of experiments that persons who are in good health can be with the tuberculous, as parents, attendants, etc., without fear of becoming infected by bacilliferous dust, provided that the sputum and dejections are carefully collected and removed, and the receptacles serving for this purpose are scrupulously disinfected.

Miller² gives the following instance: "A lady, with her five daughters, four of whom were most of the time at school, took up her residence in a house in which, six years previously, there had lived a gentleman who had died of pulmonary tuberculosis but a short time after removing from the house. For the next six years the house was occupied by an old lady who died, but not from pulmonary tuberculosis. Within a year of moving into the dwelling the mother became tuberculous and died at the end of three years. During her illness the eldest daughter displayed symptoms and signs of pulmonary tuberculosis, and left home for six weeks, returning apparently well, and remained well thereafter. A few months after the death of the mother the second daughter, who had not long been away from school, displayed similar symptoms; but she also recovered after leaving home. Several years later the third daughter, soon after leaving school, presented consolidation at the left apex and died within a short time. Stained cover-glass preparations made from the dust obtained from the dining-room of the house in which the unfortunate family lived disclosed the presence of tubercle bacilli in considerable numbers."

C. O. Maish³ gives the following case: "A German, aged sixty-two years, weighing two hundred pounds, of good family and personal history, came to him in a state of advanced consumption. Two years before he had lost a son, aged twenty-three years, from the same disease. Three months later his wife, who had nursed the son, began to sicken. She was a German, aged fifty-nine years, strong, robust, and well preserved, weighing more than 220 pounds, with a good family history. She died within twenty months, having had frequent hemorrhages from the lungs and intestine and almost constant diarrhœa. Within five

¹ Revue de la Tuberculose, 1895, iii. p. 175.

² British Medical Journal, January 13, 1894

³ New York Medical Record, October 13, 1894, referred to in Sajous' Annual for 1896.

months the husband was in the condition just described; while a daughter, aged twenty-two years, worn out from constant attention to the sick, was in a fair way to become phthisical, if not already so. It was learned that all three had expectorated on the walls, floors, and in the corners of the apartment, the man preferring to expectorate under his bed. The daughter slept in the same room with the sick man, and slept beside her mother during her illness."

From the *Traité de Médecine*, Charcot, vol. iv. p. 595, I cite the following case: In a small and ill-ventilated portion of a counting-house containing twenty-two employés, there came two tuberculous persons, coughing and expectorating often upon the floor. The employés came early in the morning to work, when the air of the place was charged with dust from the daily sweeping. Thirteen of them died from phthisis from 1884 to 1889. The contagion occurred very probably through the air holding in suspension the bacilli from the dried sputum on the floor. The small and badly-ventilated portion of the counting-house was abandoned, the floor destroyed, and the whole thing removed, and prophylactic measures instituted. Three years elapsed since this was done, and not a single new case of tuberculosis had occurred.

In asylums, prisons, and various other institutions where large numbers of human beings are kept in close contact, pulmonary tuberculosis is frequently the most common disease among the inmates and sometimes produces an almost epidemic mortality. "There are," says a report from the Illinois State Prison,¹ "1400 convicts within the walls, and fully one-third of them have consumption in a light or bad form. Nearly all deaths of persons in the penitentiary have been caused by consumption, and, as a rule, all 'long termers' either die within the walls from the disease or are pardoned out on account of it."

Baer and Cornet found that from 45 to 75 per cent. of all deaths in penal institutions were due to tuberculosis.² In the last report of the Taunton (Mass.) Lunatic Hospital for the year ending September 30, 1896, the Superintendent, in his report, says: "Seventeen died of phthisis, which was a large number, although the percentage of deaths from this disease was not greater than in many previous years. Most of the cases developed in the old part of the hospital, where the breathing-space is less and the overcrowding more apparent."

In a community of 400 Apache Indians, taken from a free nomadic life in Arizona and New Mexico and transferred to Alabama, where for four years they occupied log cabins badly constructed and situated in a low, damp hollow, and in which filth gradually accumulated "until they became veritable incubators of disease," the deaths from tubercu-

¹ Quoted by J. G. Hopkins, M.D., Thomasville, Ga., in "Contagiousness of Consumption." Reprint from the Journal of the American Medical Association, 1893.

² Flick: Medical News, October 21, 1893.

losis in five years were seventy-eight, or $43\frac{1}{2}$ per cent. of the total number of deaths.¹

All this does not prove that the tubercle bacillus will infect every person brought within its influence, or, infecting them, will produce any injurious results; for in that case few of us would escape. The second factor must always co-operate, a favorable soil. The system must be in a receptive condition, which is generally, if not always, a depressed one; the "resistance potential" is low; and coincident with this there is often some defect in the respiratory passages or in the pulmonary tissue itself, which a bronchitis, pleurisy, influenza, or pneumonia may have caused. This matter of a favorable soil, however, will be discussed later.

Although, as I have said, the dried sputum is the principal source of the tubercle bacillus, there is also a very appreciable danger of contagion from food, especially from the milk and meat of diseased animals. This infection from food takes place principally through the alimentary canal, but it has also been found by Boullard² to occur through decayed teeth or an exposed cavity in the gum after a tooth has fallen out spontaneously or has been removed. An absorbing surface is presented affording lodgement for tubercle bacilli that may be contained in insufficiently cooked meat or other food. Starck,³ in examining 113 children with cervical adenitis, found that 41 per cent. showed the presence of carious teeth, and almost always the enlarged gland corresponded to the seat of the carious tooth. He mentions two cases of tubercular adenitis, in one of which numerous tubercle bacilli were found in two carious teeth, and in the other tuberculous granulations at the bottom of a carious excavation were discovered. Cadeac, of Lyons,⁴ has demonstrated by experiments on guinea-pigs that particles of food remaining in the tonsillar crypts conveyed tubercular infection to the ganglia of the neck. Although milk and diseased meat are the principal ingesta which convey the tuberculous infection, it is well to bear in mind that food in itself free from the germ may serve as a medium of contagion by bacilli brought to its surface through dust, as in the case of the grapes mentioned; through contact with contaminated tuberculous persons; or through the utensils with which it is prepared or served. Flies, also, which have had access to tubercular sputum, may do it, as the following experience of Hoffman, of Dresden, illustrates: Finding flies in a house where a patient had died of advanced tuberculosis, and whose sputum had contained great quantities of tubercle bacilli, he took them

¹ "The Vital Statistics of an Apache Indian Community," by W. C. Borden, M.D., Boston Medical and Surgical Journal, July 6, 1893.

² *Annuaire of Universal Medical Sciences*. Sajous, 1895.

³ *Revue de la Tuberculose*, 1896, July.

⁴ *Lyon Médical*, December 16, 1894, quoted in Sajous' *Annuaire*, 1896.

home and examined them. Tubercle bacilli were found in their intestines, at first in large and subsequently in smaller quantities. Their excretions, which covered the walls of the house in the form of numerous specks, also contained tubercle bacilli.

Tuberculosis is a comparatively common disease of cattle, and, as I have said, can be communicated to man through the milk and flesh. It is a danger always present and always to be taken account of, for these articles are universal staples of food. Villemin¹ states that 2000 bottle-fed babies die every year in Paris from tuberculosis.

Ollivier² reports the following experience illustrating the danger of infection from milk. "At a school for young girls there occurred within three months eleven cases of tuberculosis, of which five were fatal; and, with many, the site of the infection seemed to be intestinal. Two other pupils of the same school died of tuberculosis, in whom the family history and previous state of excellent health warranted the statement that they otherwise would not have been infected. Upon investigating the cause of this frightful occurrence, it was found that during this period the school had obtained its milk-supply from a cow which had shown, on post-mortem examination, advanced tuberculosis of the lungs and peritoneum, and more particularly of the udder."

As to the avoidance of this danger from tuberculous animals, it is possible, I believe, practically to abolish it by strict governmental and State inspection, which has already been instituted in many States, but often very imperfectly. All herds of cows kept for milk should be tested with tuberculin, which rarely, if ever, fails; and those animals reacting to this test should be removed from the herd, and either killed or kept apart for a time under observation. The Minneapolis Board of Health compels the farmers who supply that city with milk to test their herds with tuberculin. As there is less danger from the meat of tuberculous cattle³ than from the milk, less strict measures will probably suffice. Those that exhibit clinical evidence of tuberculosis should be killed; and those exhibiting suspicious signs of the disease should be tested with tuberculin, and if a reaction is obtained, they should be either destroyed or kept apart under observation for a time. If all animals slaughtered for meat are not inspected, or all meat exposed for sale is not, which would be the more perfect way, at least all suspected animals or those from suspected herds should be examined, the internal organs as well as the muscular portion. Milk-dealers should require those who supply them with this article to give proof that their cows have been tested with tuberculin and found to be free from tuberculosis. So long, however, as inspection is not absolute or complete, the

¹ Annual of Universal Medical Sciences. Sajous, 1890.

² Ibid., 1892.

³ "La Virulence des Viandes Tuberculeuses," par E. Leciaínche, *Revue de la Tuberculose*, 2, 1894.

only safety is in boiling the milk, and a temperature of 167° has been found to destroy the bacilli.

In a recent article by L. Emmett Holt¹ the conclusion is reached, from the study of 119 autopsies of infants and young children, that infection through the alimentary canal is rare and will not explain more than 1 or 2 per cent. of the cases. In the vast majority, he thinks, the infection is through the respiratory tract. Granting this, the danger is always present that milk from an unknown source, such as is generally the case when it is exposed for sale in the small groceries, may be tuberculous, and the only safe rule is to boil it. The poor especially should be taught to do this. The well-to-do generally use either sterilized or Pasteurized milk for their bottle-fed babies. Why should one use raw milk any more than raw meat?

Roth² shows that butter can contain tubercle bacilli, and out of twenty samples purchased in the different Swiss Cantons two contained the bacillus. There is, he says, no way to destroy the germ in the butter. Our only safeguard, then, seems to be to use only milk from tested cows.

Tuberculosis can also be conveyed by the flesh of the fowl. Renzi³ says that he has not infrequently found evidence of tubercular disease in the abdomen of fowls; and instances are on record of infection produced in man by eating the flesh of tuberculous fowls. In Paris statistics have shown that it affects 23 per cent. of the poultry.⁴ Pork and the flesh of various other domestic animals has also been shown occasionally to contain tubercle bacilli.

The entrance of the tubercle bacilli through the skin, by means of a wound or abrasion, is a possible means of infection, although not a common one. The washing of infected garments, handkerchiefs, towels, bedding used by tuberculous patients, may infect the laundress if she happens to have or causes a break in the continuity of the skin on her hands or arms. Attendants upon consumptives may infect themselves by a wound from a broken cuspidor. A case is related by Harris and Beale⁵ of a cook who wounded one of her fingers with the fragments of a broken vessel containing sputum. Infection ensued, causing enlarged lymphatic glands in the elbow and axilla. The finger was finally amputated, the diseased tissue removed, and the glands extirpated, resulting in recovery. Physicians, surgeons, and medical students may become locally infected in making autopsies, in operations upon tuberculous bones, joints, and glands, and in anatomical dissections. Butchers and handlers of hides have also contracted it from tuberculous cattle.

¹ Medical News, December 12, 1896, p. 656.

² Corresp. für Schweizer Aerzte, September 1, 1894, p. 521.

³ Lungenschwindsucht, 1894.

⁴ "Animal Tuberculoses and their Relation to Human Tuberculosis," Nocard, 1895.

⁵ "Treatment of Consumption." Philadelphia: P. Blakiston, Son & Co., 1896.

Tuberculosis, like syphilis, has also been conveyed by the Jewish rite of circumcision, in which the operator frequently sucks the wound with his lips.

Dr. J. C. White ("An Etiological Puzzle," *Boston Medical and Surgical Journal*, December 5, 1895) speaks of a case of tuberculosis of the lobes of both ears. They had been bored by a woman who died soon afterward of consumption, and they were dressed by a sister who died soon afterward of quick consumption. They were also bathed with cow's milk after the operation. In some of these ways infection was produced.

He also mentioned a case of tuberculosis of the hands of a mother and daughter who had habitually washed the handkerchiefs and other receptacles of the sputa from a tuberculous father.

Fortunately, however, the infection has a tendency to remain localized. When one has much to do with tuberculous individuals, it is wise to protect all abrasions or wounds of the hands with collodion or in some other safe manner.

As there can be no tuberculosis without the specific bacillus, the great contest against the disease must be fought out with this micro-organism, and first it must be clearly understood that it is *possible* so to restrict the germ that in the future the disease may be as rare as it is now common. Since writing this last sentence I find the following corroborative testimony in a supplementary report of the New York City Board of Health, just published: "We fully believe that with proper regulation, tuberculosis may be restricted within the narrowest bounds, and eventually, perhaps, almost exterminated. This is not the idle dream of sanitary enthusiasts, but is a conviction founded upon the most thorough and conclusive experimental investigations, which have been amply confirmed by practical experience."

We have only to destroy the sputum, and the deed is accomplished, for from the pulverized sputum the majority of cases take their origin. Tuberculosis from other sources is so insignificant in comparison that we may almost disregard it. This seems to be, and is, simple enough, but its very simplicity leads to a disregard of the measures which accomplish it.

There are two principal ways in which we may set about it. First, compulsory notification, isolation, and disinfection, as in the case of other infectious communicable diseases, such as diphtheria and measles. Second, by the enlightenment of the public as to its danger and avoidance. This can be done by societies for the prevention of tuberculosis, like the one in Pennsylvania, by Boards of Health—State and city—by physicians among their clientage; by notices in all public places as to the danger of spitting upon the floor and wherever the sputum may dry; by instruction in schools; by the public press; and in any and all ways

by which the subject can be brought to the public notice. Compulsory notification already exists in some States and cities, as in Michigan, Buffalo, and quite recently in New York City. It is no new thing, for a hundred years ago the King of Naples issued the following decree :

“ Every physician is henceforth required to report to the authorities every case of consumption the instant it is recognized. Failing this, a fine of four hundred ducats (\$400 to \$900) will be exacted ; and for a second offence banishment for ten years. Poor patients shall at once be taken to the hospital. Their clothing and linen shall be kept and cared for apart from those of other patients, and an inventory be made. In case of death every article must be produced and identified by the hospital superintendent. Any infringement of this rule may be punished by imprisonment or the galleys. It is the duty of those in authority to renovate the room of a former patient—floor, hangings, and furniture coverings ; to burn the window-frames and doors, and replace them by new ones. The extreme penalty of the law will be visited on any one buying or selling the effects of phthisical patients. Every house where a consumptive dies shall be blacklisted.” If the danger from the sputum had been known, equally drastic measures would undoubtedly have been commanded regarding its destruction.

“ In Rome, at least, and I suppose throughout Italy, strict and rigidly enforced laws of notification and disinfection still exist. When a notification of a case of tuberculosis is received, the house is visited by a medical sanitary inspector. He gives complete instructions to the attendants or family. The attending physician is obliged to see that all handkerchiefs, night-dresses, bed-linen, etc., are thrown into a receptacle containing proper disinfectants. At regular intervals the disinfectors call and remove the soiled articles, thoroughly sterilize them, then wash them, and return them to the owners. This is done at the municipal expense in the case of poor people. Others pay according to their means. It is forbidden to wash any article belonging to a tuberculous patient outside of the lazaretto. All rooms which have been occupied by tuberculous individuals are cleaned and disinfected in the most thorough manner, and a record kept by the authorities of all houses in which tuberculosis has occurred, which can be consulted by those desiring to hire or buy a house.”—“ Public Health in Rome,” William G. MacDonald, M.D., *Boston Medical and Surgical Journal*, February 4, 1897.

The objections to compulsory registration are that the disease is slow and manifests great variations in its course, so that for a good part of the time the consumptive is able to be up and go about, and in many cases to pursue his usual vocation. To treat him, then, as a subject of contagious disease might isolate him to a certain extent and render it still harder to endure a lingering, painful, and, in many cases, hopeless disease. Another objection is that private business might suffer in

some cases, as, for instance, a tuberculous shopkeeper might lose his trade ; or tuberculous individuals, still able and obliged to work, might be thrown out of employment, and thus cause great hardship to themselves and family.

Properly conducted, however, I think registration would not in reality produce the undesirable results feared, or work any great hardship to the consumptive or his friends ; and, on the other hand, I believe it is fully justified, as a protective measure to the public exposed to an enormously frequent and dangerous infectious disease. As Bennet says,¹ "A diseased person in trying to save himself has no right to infect the sound public." Flick advocates registration at the breaking-down or infectious stage ; but this, I am inclined to think, is an unnecessary limitation, for the majority of the cases would be at this stage when they came to the notice of the physician. If one could always depend upon the physician to see that proper precautions were employed as to the disposal of the sputum and disinfection in his consumptive cases, registration might be less necessary ; but even physicians are sometimes careless, and in many cases a physician is only occasionally called in, or no physician is employed until late in the disease. Notification would simply mean that there was some responsible body who would see that the patient and his friends were advised as to the danger of communicating the disease and how to avoid it ; and further to institute proper disinfection of the room which the patient had occupied or in which he had died. I cannot see that he would be materially disturbed or in any way made an outcast, as some claim ; but, on the other hand, he would be assured that he was both protecting himself from reinfection and his friends and the public from infection ; for a consumptive and his room can be rendered harmless if the sputum is properly disposed of.

Dr. Irwin H. Hance, in a paper read before the New York Academy of Medicine on January 21, 1897, gives his experiments with dust collected in hospitals, dispensaries, tenement-houses, and public conveyances. Three out of four guinea-pigs inoculated with dust taken from a tenement-room in which a phthisical woman had lived and died, died of tuberculosis ; while four guinea-pigs inoculated with dust taken from a room where a patient with tuberculosis lived, but who observed the regulations of the Board of Health, showed no signs of the disease. He also found that in tenement-houses all the cleanly apartments were free from infection, thus proving "the wisdom," he says, "of granting the Board of Health power and authority to order such cleaning and renovation of tenements as is required."

For the poor, suffering from consumption, where preventive and dis-

¹ Sajous' Annual, 1890.

infectant measures are difficult or impossible of execution at their homes, on account of their poverty or ignorance; especial hospitals are needed where they can be isolated and kept from disseminating the disease as well as properly cared for. All civilized nations are now recognizing the importance and need of such institutions, and I have already noted the result of them in the case of England, where the mortality from phthisis has been reduced 50 per cent. in forty years. In the case of tuberculous individuals in the infectious stage, but still able or compelled to work, and to do so in close contact with others in shop, factory, or wherever they are a menace to those about them, I can see but one method to pursue—to remove them from their place of employment and either send them to a special hospital or a portion of a general hospital set apart for such cases, or give them a pension sufficient for their maintenance. If others are dependent upon them, some provision should also be made for them. It would, I am convinced, be economy for the State to do this, as it already does do in a similar manner in remunerating the owners of tuberculous cattle which it condemns. Moreover, the danger, I believe, warrants the step.

Innumerable sets of rules have been formulated for the disposal of the sputum and the prevention of the spread of the disease through the sputum, all essentially the same. The simpler and plainer they are, it seems to me, the better. I would venture to formulate the following.

How to avoid communicating consumption.

The expectoration—what is coughed up—contains the germs of the disease.

These germs will carry the disease *only* when the expectoration gets *dry*.

Only spit where the expectoration can be *destroyed* or kept *moist*.

Do not spit upon the floor anywhere, or in the street, or in the cars, halls, or in any vessel unless it contains water or a liquid disinfectant.

Always use a spit-cup when possible. If a paper cup is used, burn it every day, or oftener if there is much expectoration. If a glass or earthenware cup is used (a china coffee-cup will do) fill it half full of water, or a solution of carbolic acid, thirty drops to a pint of water. The cup should be thoroughly scalded with boiling water at least twice a day, and frequently boiled for half an hour.

Out of doors, where it is not possible to use a spit-cup, use pieces of cloth about ten inches square, handkerchiefs of cheap material or Japanese paper, and burn them as soon as possible. Do not allow the expectoration to become dry upon them, or use them more than once.

Great care should be taken that no particles of the expectoration lodge upon the hands, face, or clothing, or bed-clothing if in bed. If this happens they should be immediately washed off with hot water and soap.

The expectoration should not be swallowed.

The bed-clothes and linen of a consumptive should be kept separate, if possible, and boiled before washing.

Eating-utensils used by a consumptive should be washed separately, and, if possible, used by no one else.

A consumptive should sleep alone.

A consumptive should not work where he is compelled to handle the food or wearing apparel of others, or anything else which many others handle. If he is obliged to do this he should use every care to prevent any of his expectoration from getting upon his hands, upon the articles which he handles, or upon the persons upon whom he waits. He should not cough upon, or in the direction of, food or kitchen- or eating-utensils.

The living- and bed-room of a consumptive should be kept very clean and well aired, and should contain only the absolutely necessary articles of furniture. As much sunlight as possible should be admitted; and there should be constant ventilation night and day. A room with an open fireplace is to be preferred. There should be no dusting or sweeping, but a moist cloth should be used for cleaning.

A room that has been occupied by a consumptive, or in which a consumptive has died, should be thoroughly disinfected in the following manner:

Carpets, curtains, and bed-coverings should be exposed to superheated steam under high pressure, or where facilities for this do not exist, they, with all stuffed furniture, should be thoroughly shaken and brushed, and exposed to the open air and sunlight for several hours. The floor and walls of the room should be rubbed with new bread, followed by the application of a 1 per cent. solution of chloride of lime, or a corrosive sublimate solution (1 to 500); ceilings should be thoroughly dusted and white-washed. Every corner wherever dust is likely to lodge should be carefully cleaned. The windows should be left open for twenty-four hours. Prof. E. P. Pfuhr¹ has found that formaldehyde gas will readily destroy tubercle bacilli. This gas can be easily generated from methyl (wood) alcohol, and it would seem to be an efficient, cheap, and easy method of disinfecting a room and its contents without injury to them.² It would be a wise and economic step if town authorities should provide disinfecting apparatus, which could be used for other infectious diseases as well as tuberculosis.

"In Rome, Italy, after a death from tuberculosis the following is the method of disinfection: If the floor be carpeted, they first spray with corrosive solution, 1 to 500, combined with chloride of sodium, so that no dust may arise. Then the carpet is removed, the floor being continually

¹ Zeitschrift für Hygiene und Infection Krankheiten, xxxii. 339.

² Further experience has proved the efficacy of this method.

wet under it during the process of removal. If a bare floor exist, it is immediately drenched with a plentiful supply of 1 to 3000 corrosive, combined with hydrochloric acid. All carpets, bedding, mattresses, portières, curtains, clothing, or anything of like nature are rolled up in sterilized sheeting and removed, to be treated in steam sterilizers. The walls are then thoroughly drenched with corrosive, 1 to 500, and chloride of sodium. This drenching is done with a small hand-pump. After the drenching a vigorous scrubbing takes place, and, if need be, a vigorous scraping, too. Each chair is taken to the tub and thoroughly scrubbed with the solution. Stuffed furniture is treated with the corrosive and sodium solution, which they consider harmless. Metal articles, such as brass beds, are rubbed over with a phenic-acid solution. Water-closet bowls are swabbed out with slaked lime. Landlords are then obliged to paint, paper, and whitewash the rooms at their own expense."—"Public Health in Rome," William G. MacDonald, M.D., *Boston Medical and Surgical Journal*, February 4, 1897.

In schools, teachers should admonish the scholars as to the danger of spitting upon the floor, and cuspidors should be provided.

Spittoons, says Cornet, and the writer agrees with him, should be placed wherever it appears necessary, in every enclosed space frequented by men; in hotels, restaurants, places of amusement, workshops, factories, counting-houses, corridors, stair-landings, railroad stations, steam-cars, street-cars, steamboats; and on the wall near each spittoon there should be a notice: "Spittoon for those troubled with cough or who have to spit. Spitting on the floor is dangerous and the means of carrying disease." These spittoons should be eight to ten inches in diameter, two inches high, smooth, slightly inverted edges, made of strong, smooth glass, porcelain, earthenware, or enamelled iron, and should contain water to the depth of half an inch.

In medical out-patient departments of hospitals and dispensaries, circulars with plain, simple directions as to the avoidance of tuberculosis should be given each patient, and to the tuberculous ones, in addition, rules for disposing of the sputum. In the waiting-rooms of these institutions spittoons should be provided, and notices as to the danger of spitting on the floor posted. Dr. Hance¹ has demonstrated the existence of tubercular dust in the waiting-room of a dispensary. Street-cars are now beginning to have notices posted in them forbidding spitting. The following is the one seen in the Boston cars:

"Health Department of the City of Boston, October 13, 1896.

"The Board of Health hereby adjudges that the deposit of sputum in street-cars is a public nuisance, source of filth, and cause of sickness, and hereby orders that spitting upon any floor of any street-car be, and hereby is, prohibited."

¹ Loc. cit.

A shorter and simpler one would seem preferable for accomplishing the object, when one considers the various nationalities who travel in the cars, and their limited knowledge of English.¹

The cleansing of all places where many people congregate should be thorough, and dry sweeping abandoned. Especial and thorough disinfection should be practised, at the end of the season, in hotels at health resorts frequented by phthysical patients, and at frequent intervals in cars where such patients travel, as on some of the Southern routes. Petri² and Prausnitz,³ in experiments upon the disinfection of railway carriages, found that simple washing with soap and water was quite efficacious.

The streets of cities and in thickly settled portions of towns should be kept well watered and dust not allowed to blow about, as one often sees it in the wake of a horse-sweeper. Sweepings from shops and stores should not be thrown into the streets.

If these various measures were rigidly observed, there is no doubt that a constant and marked diminution of the disease would be quickly observed; indeed, facts have already proved this to be so, for since 1887, when the German authorities instituted prophylactic measures, the mortality from the disease in Prussian prisons, for instance, has steadily diminished. Before these measures the deaths per 10,000 inmates from tuberculosis were 118.9 from 1875 to 1876; 140.8 from 1878 to 1884; 174.7 from 1884 to 1887. After the prophylactic measures 101 from 1887 to 1890; 89.4 from 1890 to 1892, and only 81.2 from 1892 to 1894. In Prussia from 1875 to 1886 the general mortality from tuberculosis was more than 30 per 10,000 inhabitants; since the application of prophylactic measures it has fallen below 25, and a similar diminution is noted in other German States.⁴

THE FAVORABLE SOIL. We come next to the consideration of the *favorable soil*, which must exist conjointly with the bacillus in order to produce the specific infection. Exactly what constitutes this receptive state it is difficult to say, but we may define it in general as a condition of health below the normal standard, either temporary or chronic, with a coexistent, weakened pulmonary tissue. If we do not always know precisely the physical state which offers the favorable soil, we do know innumerable conditions which experience has proved to be conducive to it, as well as innumerable causes which produce these conditions—causes existing or developed either in the individual or in his environment.

(a) *The individual.* Regarding inheritance, most authorities now agree, I think, that only a *tendency* to the disease at the most is meant

¹ Since writing the above a simple statement that spitting is prohibited under a penalty of \$100 has been substituted.

² *Revue de la Tuberculose*, 1894, p. 16.

³ *Deutsche medicinische Wochenschrift*, June 12, 1894.

⁴ Cornet: *Le Bulletin Médical*. Paris, May 26, 1895.

by the term ; and the facts are ostensibly in accord with this interpretation of the word. Genuine, direct inheritance of the bacillus from the mother to her infant has been proved to be possible, although exceedingly rare. I am obliged to express serious doubt, nevertheless, that even a *tendency* is inherited. It seems to me that the apparent fact is explicable thus : descendants of consumptives are very frequently born with lowered vitality, poor physical development, and a lack of vigor, constituting a diminished "resistance potential." This condition is often still further accentuated by the mode of life followed. From the very fact that there is a lack of muscular development and vital force, a sedentary, indoor occupation is naturally chosen, which still further depresses the system and weakens the pulmonary tissue as well as increasing the opportunities of bacillary infection. Let the same conditions exist in one not born of consumptive ancestry, and I believe there would be as great a likelihood of contracting the disease as in the former case. In an analysis of 100 city men of various occupations I obtain the following suggestive results :

Sixty-two of indoor occupations had fathers of indoor occupations also.

Sixteen of indoor occupations had fathers of outside occupations.

Six of outdoor occupations had fathers of indoor occupations.

Sixteen of outdoor occupations had fathers of outdoor occupations.

Thus is shown the strong tendency from the more wholesome outdoor life to the less wholesome indoor.

On the other hand, given a strong, robust individual, well developed, and of good vitality, born of consumptive ancestry—a condition not infrequent—and I believe he is no more likely to suffer from pulmonary tuberculosis than one of like physical condition born of parents with no phthisical taint in their ancestry. At least, there is no doubt in my own mind that many cases of consumption attributed to inheritance are in reality caused by the same vicious conditions under which the parents lived and by the greater opportunity of exposure to the bacillus. This, I think, is at least a partial explanation of the large number of cases of apparent inheritance (107 out of 232) in the analysis of the 232 hospital cases (*vide table*). Of course, many other causes also incident to their mode of life and occupation played an important rôle in causation.

Granting an inherited tendency, it is but small. Edward Squire, of London,¹ made an analysis of 1000 cases, and concluded that the influence of heredity could not be placed higher than 9 per cent of cases among children of phthisical parents in excess of the cases occurring among the children of non-phthisical parents. He also continues to say

¹ Lancet, December 15, 1894.

that hereditary influence in phthisis is not a true heredity, but a tendency to suffer from disease—tuberculosis among other complaints—which the offspring of phthisical parents has in common with the children of weakly parents, from whatever cause this delicacy may arise. The children of phthisical parents contract the disease earlier because they are exposed to the infection at home. The family house and its surroundings are, therefore, much more dangerous than the pedigree.

In the 2700 young men I examined (*vide table*) but 5.9 per cent. had lost one or other parent from consumption. I must confess myself, then, from the foregoing reasons, quite in accord with Whittaker's conclusions that "The idea of a predisposition is dangerous, because it removes attention from the avoidable sources of the disease. It is unsatisfactory, because it does not prove enough. It is also undemonstrable, and the experiments made to prove it are all open to objection. Finally, it is superfluous."¹

But whatever may be the family history, every person of imperfect muscular development, low vitality, and deficient respiratory capacity—all indicating a diminished "resistance potential"—is a possible candidate for the bacillus, and should receive especial training and attention to remedy as far as possible this congenital or acquired condition. From a child up, he should be carefully watched. If his mother is a consumptive, she should not nurse him. Nutrition, respiration, exercise, rest, clothing, fresh-air supply, and place of abode should all receive careful attention. Such a person should live an outdoor life so far as possible.

Whenever, in the remote past, pulmonary tuberculosis first originated it was probably coincident with the building of closed places of abode, for it is, for the most part, a disease of indoor life; and this fact cannot be emphasized too strongly in all discussions upon its prevention. We seem to have reversed the natural order of things, and instead of regarding indoor life the exception, we make it the rule. Even when we transfer ourselves from one abode to another we do not enjoy the fresh air in transit as we often might, but enter a closed vehicle, like a street-car, almost invariably filled with impure air and foul smells. We have grown so accustomed to this abnormal life that its dangers are lost sight of, but they are not the less real, and especially menace those of deficient vitality whom we have been considering. For them, at least, outdoor life and occupation is most desirable.

Of the many predisposing causes existing or developed in the individual we have, first in importance, malnutrition and defective assimilation, and these again are produced by a variety of causes; dyspepsia is a common one. As some one has said, "Stomach troubles are power-

¹ An American Text-book of Therapeutics, 1896.

ful predisposing causes of tuberculosis." Of the 2700 young men I examined, dyspepsia was complained of in about 15 per cent. Insufficient and improperly cooked food, rapid eating or eating when exhausted, decayed teeth or absence of teeth, irregular habits, lack of or insufficient physical exercise and fresh air; intemperance in eating and drinking are all causes of dyspepsia, and their mention suggests the remedy. Good teeth are a very valuable safeguard against pulmonary tuberculosis, and free dental hospitals or clinics for the deserving poor, as advocated by Dr. R. C. Newton,¹ would, I believe, remove a not insignificant factor in the causation of the disease among this class of people. The custom now so largely prevalent of protecting the first dentition until the second arrives is undoubtedly a valuable means of protection against the entrance of the bacilli through a carious cavity or a cavity from which a tooth has been extracted, which is a real danger, as I have shown above.

Dyspepsia, moreover, is often the direct prelude to phthisis, and when accompanied with loss of weight and appetite, a quickened pulse, and, perhaps, a slight rise of temperature, an examination of the lungs ought always to be made, and the individual kept under careful observation. I vividly recall the case of a young woman who consulted me for what apparently seemed to be a case of ordinary dyspepsia, and in whom I neglected to make a physical examination of the lungs. She developed phthisis subsequently, of which she died. In such cases a spirometric test is of value, as advocated by Otis.² Anæmia, which is also a result of dyspepsia, as well as various other depressing conditions, is a prolific predisposing cause, and its origin must be sought for and remedied. Indoor life, insufficient rest, deprivation of sunlight, exhausting discharges, irregular habits, and worry are some of its causes. Intemperance in alcohol, especially among the working people, is another frequent cause. In the 232 consumptives treated in the hospital (vide table at end) I obtained a history of alcohol to excess in ninety-five. Probably the alcoholic habit was accompanied in most of the cases by irregular habits and exposure which intensified its injurious influence, as in the case of teamsters, who contributed 6 per cent. in the above number of consumptives.

All exhausting discharges, particularly leucorrhœa, menorrhagia, excessive lactation and rapid child-bearing, sexual excesses, depress the system and lower the "resistance potential." Amenorrhœa is frequently a danger-signal and evidence of that anæmia which precedes the tubercular outbreak. Imperfect convalescence from pneumonia, pleurisy,

¹ "What Shall be Done for the Teeth of the Poor?" Read before the New Jersey State Dental Society, August 3, 1895.

² "Some Methods of Chest Examination Supplementary to Auscultation and Percussion." Reprint, 1895.

bronchitis, influenza, or diphtheria leaves the pulmonary tissue in a particularly susceptible condition, and the general system in a depressed state. Respiratory gymnastics are of great value in these cases, to which I shall refer again in speaking of respiration. The childhood diseases of whooping-cough, measles, and scarlet fever are also frequent predisposing causes, and very much in the same way as the cases of imperfect convalescence. Strictly enforced notification laws, isolation, thorough disinfection will best reduce this danger, and we ought to consider it the exception for a child to contract any of these diseases, instead of the rule, as is too much the case now. The present system of daily school inspection by a health officer, practised in some of our cities, is a valuable preventive measure.

The so-called "neglected cold" is often adduced as a frequent exciting cause of pulmonary tuberculosis, and when one considers the number of colds the community suffers from in this climate, such would seem to be the fact. In the 2700 men examined, 41.4 per cent. complained of colds in the head or throat; and in the 232 consumptives, seventy-nine attributed the exciting cause to a cold. The underlying cause, however, is to be sought for. What causes the colds? Impure air, dust, extreme and sudden alternations of temperature, excessive indoor temperature, dry heat, lack of physical exercise and inadequate respiration, neglect of daily cold bathing of the throat and chest, an excessive amount of clothing, insufficient sleep and rest, mouth-breathing, excess in eating and drinking, constipation. These neglected colds, or frequently recurring catarrhal affections, whatever the underlying cause, "may form predisposing causes," says Webber,¹ "either by producing sore places in the mucous membrane and thus allowing the bacilli to settle, or by weakening the epithelial cells of the mucous membrane and their ciliary action, or by causing imperfect breathing from unconsciously avoiding deep inspiration in order to avoid coughing, or by weakening the nutrition and energy of the whole system."

The treatment is not by futile attempts to avoid exposure, and by indoor coddling, but by hardening, exposure to the outdoor air in almost all weathers, free ventilation when indoors, sponging the chest and throat with cold water every morning, woollen underclothing of moderate thickness, physical exercise out of doors and in the gymnasium.

The nasal cavities, post-nasal spaces, and tonsils are all possible sources of infection. Dieulafoy² took fragments of hypertrophied tonsils and adenoid vegetations and injected them into guinea-pigs. Out of sixty-one hypertrophied tonsils he found eight tuberculous, and in thirty-five cases of adenoid vegetations seven were tuberculous. Strauss³ has shown the presence of tubercle bacilli in the nasal cavities of healthy

¹ "Chronic Pulmonary Phthisis," 1885.

² *Revue de la Tuberculose*, vol. iii., 1895.

³ *Revue de la Tuberculose*, vol. ii., 1894.

individuals associating with consumptives more or less constantly as attendants, nurses, etc. (presumably when the sputum was not properly disposed of). In twenty-seven well persons nine were found to have virulent tubercle bacilli in their nasal cavities. So long as the nasal epithelium remains intact the bacilli are harmless, and we have what M. Verneuil called "latent microbism." If, however, the epithelial barrier is broken through, the microbism may become an active one, as Louis has shown in the case of young subjects who have become tuberculous after repeated attacks of epistaxis.

Whenever, then, hypertrophied, spongy tonsils or adenoid growths exist, as they so frequently do in children, they should be removed; not only, as has just been shown above, do they offer a favorable soil for the bacillus, but, also, by partially occluding the upper respiratory passages, interfere with full free respiration, and so diminish the lung capacity and limit chest expansion. The so-called "chicken-breast" is not infrequently the result of such obstruction. The anterior nasal passages should also be kept freely open, and any defect in the physiological action of the mucous membrane—hypertrophy or atrophy—remedied.

Enlarged cervical glands, a very common occurrence in childhood, and from a variety of causes, are in a certain proportion of cases tuberculous, as is illustrated in the case of the carious teeth I mentioned earlier in the paper. Valland¹ maintains that tuberculous infection of the lungs in later life is secondary to tuberculosis of the lymph-glands in childhood, and in 101 out of 108 tuberculous individuals he found enlarged cervical glands. Among 2506 persons examined, enlarged cervical glands were found between the ages of seven and nine in 96 per cent.; between ten and twelve in 91.6 per cent.; between thirteen and fifteen in 84 per cent.; between sixteen and eighteen in 69.7 per cent.; between nineteen and twenty-four in 68.3 per cent. Tubercle bacilli were found in the cervical lymph-glands in about 68 per cent. of adults.

Enlarged cervical glands are always a menace to the individual both from the possibility that they may be tuberculous, or become so, and from the depressing effect upon the general system, particularly if they break down and suppurate. They may be caused by carious teeth, hypertrophy of the tonsils, purulent otitis, eczema of the head, irritation from pediculi capitis, adenoid vegetations, and other irritative causes. They are also common in children, apparently as a local manifestation of an anæmic condition resulting from malnutrition and an unhygienic environment. They are to be treated generally and locally. All sources of irritation are to be sought for and removed. If the glands are few, or

¹ Annual of Universal Medical Sciences. Sajous, 1895.

there is but a single one, and their position and depth render their removal a comparatively simple operation, I should advise total extirpation. I have had most satisfactory results from this procedure. In non-suppurating glands Ingals, of Chicago,¹ suggests the injection of lactic and carbolic acid, from 15 to 40 per cent. of the former and 2 to 5 per cent. of the latter, and he narrates a successful case from this treatment. If there is suppuration, the gland can be thoroughly scraped out, as advised by Mr. Treves, or drained with a Briggs² canula; or it can be drained through a small opening, washed out with peroxide of hydrogen, and the cavity filled with iodoform emulsion. External applications have proved almost, if not quite, useless in my hands. For general treatment, good hygiene, pure air, sunlight, nourishing food, iron, arsenic, and cod-liver oil. Experience has proved that sea air and bathing are most beneficial in such cases; hence the many sanatoria in Europe, on the coasts, for strumous children.

An unstable nervous state or a depressed nervous tone interferes with the healthy normal functions of the body, and so reduces its "resistance potential." Loss of sleep, or frequently interrupted sleep, worry, despondency, disappointment, long or extreme mental application, all depress the nervous system. When one is obliged to be much with the disease, and long at a time, great care should be taken to maintain the nervous system in a normal condition by an abundance of sleep in a well-ventilated room, sufficient exercise and change, and freedom from worry and other depressing influences.

It is noways unlikely, it seems to me, that too much and too heavy clothing has been one of the predisposing factors to the disease far more frequently than insufficient clothing. The old idea is still commonly entertained that a consumptive must be smothered in clothing and incarcerated in a tight, superheated room. The neck-muffler and chest-protector are still in common use. The only safety for weak lungs is to develop and strengthen them by use in pure, out-of-door air, and to promote a vigorous condition of the whole body by exercise, cold bathing, and exposure in the air; heavy clothing and inactive indoor life only increase the existing local and general weakness. Woollen underclothing is advised, for it preserves an equable skin temperature better than other fabrics; but it should not be too thick or heavy. The garments should be loose, and for women the "Flynt waist" is admirable. Cold bathing, to which I have just referred, is useful in giving tone to the nervous system, as well as promoting the activity of the skin. It plays an important rôle in the treatment of tuberculosis in all the European sanatoria. It can be applied in various ways: the simple sponge bath, either of the entire body or of the chest and neck; the

¹ Transactions of the American Climatological Association, 1896.

² Ibid., 1896.

spray needle, or shower bath, and the wet-pack. It is well to gauge accurately the temperature of the water by the thermometer. Public baths in the larger cities of this country are becoming more common, an admirable example of which is the one recently erected at Brookline, Mass., with its swimming-tank eighty feet in length. These, together with improved construction in tenement-houses and stricter factory inspection, increase the "resistance potential" in the poor and help to establish individual immunity. The air-bath and sun-bath are also valuable supplements of the water-bath, or can be used alone.

Inadequate and partial respiration is, I am convinced, a frequent predisposing cause of tuberculosis, and also a very common condition. Not only is the resisting power of the lung tissue diminished, but the aëration of the blood, upon which depend so largely all the vital processes, is imperfectly performed. Full and free respiration strengthens the pulmonary tissue, increases its vitality, and consequently its "resistance potential." By a habit of full and deep breathing, once established and persisted in daily, "one is fortifying himself," says Otis,¹ "against the possibility of disease of the lungs by thus maintaining the pulmonary tissue in an active, healthy, and well nourished condition; and there is no portion of the apices which, from insufficient use and poor nourishment, is a menace to the individual by offering a fitting soil to a wandering bacillus. In convalescence from pneumonia and pleurisy with effusion, the importance of expanding and revivifying, as soon as possible, the lungs whose functional capacity has been diminished and whose nutrition has been depressed, can hardly be overestimated." The especial respiratory exercises are simple and yet efficacious—standing erect and making long, deep inspirations and slow expirations; combining the arm movements with the respiratory act by raising them to a horizontal position, and then over the head until the hands meet, slowly and deeply inspiring while performing the movement, and expiring while lowering the arms; raising the arms and carrying them back and down, describing a movement of circumduction; extending the arms in a horizontal position and bringing them forward and then sharply back. Then there are various exercises with wands, and if one has access to a gymnasium, the various devices there for increasing the lung capacity and developing the respiratory muscles, the "chest developers," "lung expanders," quarter circle, or many of the heaving movements of the Swedish system. Of course, there is an infinite variety of general exercises which produce a more energetic respiratory activity, such as swimming—most excellent for increasing the lung capacity—skating, tennis, running, jumping, bicycling, rope-jumping, hill-climbing, dancing, and the like.

¹ "The Value of Respiratory Gymnastics," etc. Boston Medical and Surgical Journal, May 28, 1896.

(b) *The environment.* In the question of environment and the part it plays in the causation of tuberculosis there enter various considerations: the climate, one's abode and place of occupation, character of the soil and subsoil, drainage, ventilation, opportunities for light and sunshine. I do not believe that climate directly plays an important rôle in the causation of phthisis, although it is a most potent factor in its treatment; for the disease, as I have said, exists in every climate, from the Arctic zone to the tropical regions. Indirectly, however, its influence is felt, when, for instance, on account of its severity, one is compelled to live indoors a large portion of the year, for indoor life has its especial dangers, as all artificial life does. When one can choose the situation of his abode, it should be upon a dry foundation, either naturally so or made so by drainage, for soil and subsoil dampness has been shown to be a potent predisposing factor. In Salisbury, England, the mortality from phthisis was reduced 50 per cent. by deep and thorough drainage of the subsoil.¹ The construction of the dwelling should be such that an abundance of light and sunshine can enter; sunshine is one of the best bacillicides. A supply of fresh air and the escape of foul is also to be provided for. When the rooms are small, either in a dwelling or shop, if a constant current of air is maintained, the living conditions will be wholesome. Especially necessary is it that sitting and sleeping rooms should have constant and thorough ventilation, and this can often be attained by some of the simple means of window ventilation in conjunction with an open fireplace. Night air is not only *not* injurious, as many think, but, on the contrary, it is often purer than day air, which contains more dust from the movements of the various day activities. In the majority of cases, for a dwelling-house, the best combination for ventilation and heating is probably the hot-air furnace and the open fireplace. With the increasing interest in tenement-house reform, the erection of model structures of this class will insure to the poor, it is to be hoped, adequate provision for ventilation, cleanliness, and light. Back-to-back tenement houses on narrow, dark alleys or "places" are prolific breeders of phthisis, not only by disseminating tubercle bacilli, but by preparing a favorable soil for them. It is well to recall Trudeau's noted environment experiment here. He inoculated a number of rabbits with the same quantities of tuberculous virus. Half of them were allowed to run free in the open air, and the other half were placed in a dark hole under ground. They were all killed at the same time. Those which had run free had either recovered entirely or showed only localized lesions, while the other half showed wide dissemination of the disease. In workshops and factories careful and frequent inspection should require proper ventilation and

¹ Ransome: "The Treatment of Phthisis," 1896.

freedom from dust. In churches, school-houses, theatres, libraries, public halls, reading- and recitation-rooms, where inadequate ventilating facilities or neglect of their use are so common, the remedy must come both by educating the people as to the dangers of impure air and by municipal or town inspection and control. If it is considered necessary to detail an officer at any assembly to see that order is maintained, at least equally important is it for the well-being of the assembled crowd to have an inspector on hand to see that they breathe pure air. How common an experience it is to find a country church filled with a drowsy audience, breathing foul and stagnant air, while the pure winds of heaven surrounding it on all sides are sighing for entrance. As Ransome¹ well says, "The ventilation of ball-rooms, concert-halls, theatres, and places of worship is a scandal to civilization."

I have frequent occasion to pass through a large reading-room, invariably redolent of stale and malodorous air, where no apparent means of ventilation exists or is thought of, although thousands of dollars have been expended upon abundant and varied literature, probably containing among it excellent treatises upon ventilation. What better arrangement for cultivating a favorable bacilli soil!

In cities and large and thickly settled towns, it is of vital importance that there should be abundant and ample air spaces, by wide streets and frequent small parks. Narrow and blind alleys, which do not allow a sweep of air through them, and act as cul-de-sacs for stagnant, impure air, ought not to be allowed. Steam-cars and street-cars in the winter in this climate are generally almost hermetically sealed, and every one is familiar with the evil odor of foul air which greets him on entering a street-car from the outer pure air. It seems well-nigh hopeless to convince the average traveller that air breathed and rebreathed is more dangerous by far than cold air or draughts. The remedy must come through the management of lines of travel and the slow enlightenment of the travelling public. Who ever thinks to inquire whether a steam or electric car is thoroughly aired out after a journey before beginning another?

One's occupation, as well as the conditions under which it is pursued, may be a predisposing cause of tuberculosis, by directly weakening the lungs as well as the general health. Those employed where there is much dust, such as stone-cutters, knife-grinders, potters, dyers, wool-carders, cigarmakers, polishers, and the like, especially when the work is carried on in confined spaces, have always suffered a large mortality. Dr. Greenhow calculated² that 45,000 deaths occurred annually among those thus employed in England and Wales, and he believed that the whole of this mortality was preventable by the introduction of better methods of ventilation and working.

¹ "The Treatment of Consumption," 1896.

² J. Edward Squire: "The Hygienic Prevention of Consumption," 1893.

Printers, compositors, tailors, dressmakers, bakers, and those who work in ill-ventilated, poorly lighted, and damp places, or where smoke and various irritating gases are generated, contract phthisis readily. Teamsters are also frequent sufferers from the disease, probably from their irregular life and alcoholism.

The only way of reducing the mortality from these unwholesome occupations is to make the hours of labor short and the conditions under which they are pursued as favorable as possible. There should be rigid State inspection of all places where they are followed. Sufficient air-space and ventilation should be required; every means known to dispose of the dust, and, if necessary, respirators should be provided for the workmen.

I have endeavored in the above, with more or less completeness, to portray the causes and conditions of pulmonary tuberculosis; the danger from the tubercle bacillus on the one hand, and from a diminished "resistance potential" on the other. I have also indicated the means of prevention. When one considers the almost innumerable number of these causes which promote a tubercular state he may well be appalled, and feel inclined to abandon all attempts at prevention as hopeless. On the other hand, however, what has already been accomplished, as I have shown above, encourages one to continue the struggle and increase his exertions against this most destructive disease of modern times. To restrict the spread of the specific micro-organism and to fortify the body against its insidious influence, and increase the "resistance potential," are the two simple lines along which we are to advance in the contest. I firmly believe that it is possible, by a union of all the resources at hand—State and law, individual and organized exertions, enlightenment of the public as to the dangers of the dried sputum and their avoidance, and a utilization of all the means at our command to increase the general average of health—so to reduce the mortality from consumption that it may become one of the rarer diseases instead of the most common and fatal, as now. The medical profession has labored long and painfully, and with lamentably little success, in its attempts to cure the disease or discover a specific for it. Let it now turn its attention to prevention and enlist the public in its endeavors. The outlook is infinitely more hopeful in this direction; and prevention, whether one is dealing with crime, poverty, or disease, is better and more scientific than attempt at cure.

TABLE I.—ANALYSIS OF 232 HOSPITAL CASES OF PULMONARY TUBERCULOSIS TAKEN CONSECUTIVELY.

(Omitting a few cases in which no sufficient history could be obtained.)

Number of males	152
Number of females	80
Married,	26
Single or unknown	54
Occupations of men :	
Indoor	91
Outdoor	53
Unknown	8
Occupations of women :	
Domestic or housework	47
Special occupations :	
Printers	5
Teamsters	14
Stone-cutters	9
Factory operatives	10
Dusty occupations	39 +
Laborers or other unskilled work (not incl. teamsters)	45
Skilled workers (generally indoor)	79
Father, mother, brother, or sister (one or more) died of pulmonary tuberculosis in	107
Out of 145 cases (in which some record was attempted, though imperfect) a history of continued intimacy as caretaker, wife, husband, etc., was given in	23
Alcoholics	97
Exciting causes given :	
Result of pleurisy	11
" " pneumonia	14
" " grippe	13
" " cold	79
" " hæmoptysis	15
After miscarriage or childbirth	6
Began with "cough"	47

TABLE II.—EXAMINATION OF 2700 APPARENTLY WELL YOUNG MEN.

	Per cent.
Complained of cold in the head or throat	42.6
" " dyspepsia	14.85
" " bilious attacks	10.96
" " habitual constipation	7.63
" " shortness of breath	9.2
Had had bronchitis	6.1
" " pneumonia	5.0
" " pleurisy	1.0
" " enlarged glands in the neck	3.5
" " spitting of blood	1.3
One parent had died of consumption in	5.9
Both parents had died of consumption in	0.2

ON NEPHRITIS OF MALARIAL ORIGIN.¹

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THE fact that albuminuria may occur in the course of malarial fever as well as during other acute infections is well known.

Martin-Solon² estimated that it occurred in a quarter of all cases.

Laveran,³ however, believes that this is a high percentage for the simple non-pernicious fevers.

Joseph Jones⁴ refers to its occasional occurrence, but says: "In several hundred examinations of the urine of the different forms of malarial fever in the Marine Hospital of Savannah, Georgia, albumin was found in only one case, which was complicated with typhoid fever. This fact is important in its bearings upon typhoid and yellow fever."

Anders,⁵ in 1780 cases collected from the records of various hospitals in Philadelphia, noted only eighteen cases in which albuminuria ("marked") was found.

Hertz⁶ asserts that "It is no very uncommon thing to find albumin present in considerable quantities. . . . Albumin is to be found in the urine either only on the fever days or during the intermission as well (fibrinous tube-casts have also been observed) and disappears on recovery."

Atkinson⁷ observed seventy-six cases of intermittent and remittent fever in which albuminuria occurred five times; in a second series, however, occurring during the late summer and fall of 1883, forty-five in number, albuminuria was noted in six instances.

Kelsch and Kiéner⁸ say that in ordinary malarial fevers "The presence of albumin is not rare in paroxysms of a certain intensity, but it is particularly common in relapses in old sufferers where the kidney is already altered." They say that in the more severe bilious and gastric fevers (p. 453) "Albumin is frequent enough, but inconsiderable in quantity and transient; it may be intermittent and disappear with the paroxysm, or it may continue during the intermission."

Despite the relative frequency with which some observers have noted albumin in the urine of malarial patients, its presence or absence has been used as a point in the differential diagnosis between certain forms of severe malaria and yellow fever, in which latter affection the early appearance of albumin is the rule.

¹ Read before the Association of American Physicians, May, 1898.

² *Gaz. Méd. de Paris*, 1848, iii. s., T. iii., Année xix. 618.

³ *Traité du Paludisme*, 8°, 1898, Paris.

⁴ *Medical and Surgical Memoirs*, vol. ii. p. 772.

⁵ *Journ. of the Amer. Med. Association*, 1895, vol. xxiv. p. 916.

⁶ *Ziemssen's Cyclopædia*, American edition, vol. ii. p. 641.

⁷ *THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES*, 1884, vol. lxxxviii. p. 149.

⁸ *Maladies des pays chauds*, p. 144.

McLean, in *Reynolds' System of Medicine*, says: "Albuminous urine is almost invariable in yellow fever, only occasional in remittent;" again, of the urine in remittent fever, he says: "It . . . seldom contains albumin. . . . Albuminous urine is the rule in yellow fever, a rare exception in remittent."

Ascoli,¹ Dubujadoux,² and others have noted the existence of peptonuria in association with the malarial paroxysm.

The occurrence of actual *acute nephritis* in connection with malaria has also been recognized for many years, Chénouard,³ Hertz,⁴ Soldatov,⁵ Dewalsche,⁶ Verhaeghe,⁷ Schmid,⁸ Pepper,⁹ Busey,¹⁰ McLean,¹¹ DaCosta,¹² Wood,¹³ Rosenheim,¹⁴ Atkinson,¹⁵ Bermann,¹⁶ Stefanowicz,¹⁷ Dods,¹⁸ and many others noting this condition.

Throughout the Southern States, as testified to particularly by the admirable records of Joseph Jones,¹⁹ the condition is not very infrequent. The grave and often fatal acute nephritis following hæmoglobinuric attacks is well known. These cases have been well studied by Bastianelli,²⁰ Kelsch, and Kiéner,²¹ who have described at length the changes in the kidneys following the acute malaria. They believe that severe acute diffuse or glomerulo-nephritides may depend directly upon the malarial infection. They say that nephritis occurs in more than half the fatal cases. "It develops in the cases where the disease has a relatively long duration, and has been marked by symptoms of corpuscular dissolution, especially by hæmoglobinuria, from which we may conclude that it depends less upon the direct action of the malarial poison on the kidney than upon the irritation produced in the gland by the passage of the hæmoglobin and its derivatives."

Bignami,²² in his valuable studies upon the anatomical alterations in acute malarial infections, noted the fact that the kidneys were, as a rule, but little affected. The glomeruli were markedly pigmented, the pigment granules sometimes seen within large colorless cells, sometimes apparently within the endothelium of the glomerulus; at times the most important lesions consisted of an exfoliation and degeneration of the

¹ Lav. d. Cong. d. Med. Int., 1892, Milano (1893), vol. v. p. 350.

² Arch. de Méd. et Pharm., Paris, 1892, p. 437.

³ Rec. des Travaux de la Soc. Méd. du Depart. d'Indre-et-Loire, 1845, 2 s. 101.

⁴ Op. cit.

⁵ St. Petersburg. med. Woch., 1878, iii. 345

⁶ Arch. Belges de Méd., Mil., 1859, xxiii. 20.

⁷ Ibid., 1860, xxvi. 31.

⁸ Deutsche Klinik, 1852, 442.

⁹ THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, 1866, vol. ii. pp. 405, 408.

¹⁰ Ibid., 1873, vol. lxxv. p. 123.

¹¹ Op. cit.

¹² Medical Record, New York, 1880, vol. xvii. p. 54.

¹³ Ibid., 1888, vol. xxxiii. p. 320.

¹⁴ Deutsch. med. Woch., 1886, xii. 752.

¹⁵ Op. cit.

¹⁶ Internat. klin. Rundschau, Wien, 1894, viii. 1844.

¹⁷ Wien. klin. Woch., 1893, vi. 365.

¹⁸ Edinb. Med. Journ., 1888, xxxiii. ii. 1890.

¹⁹ Op. cit.

²⁰ Ann. di med. Nav., Anno 1896, ii.

²¹ Maladies des pays chauds, 8°, Paris, 1889, and Arch. de phys. norm et path., Paris, 1882, 2 s. ix. 278, 458.

²² Atti della R. acc. med. di Roma, Anno 1890, xvi. s. ii. v. 317.

epithelia lining the capsule, and only in algid pernicious fever did he find glomeruli with very slight albuminous exudates. Sometimes, however, marked and extensive alterations of the parenchyma were found, consisting of focal necrosis of the epithelia, especially those of the tubuli contorti.

Barker,¹ out of four fatal cases of malarial fever, found in three instances that the kidneys showed but few changes, consisting of a slight pigmentation of the glomeruli, with albuminous exudates and casts, and a more or less swollen and degenerated condition of the epithelium of the convoluted tubules. The fourth instance was one of marked acute nephritis, which was probably of malarial origin, although complicated later in its course by a streptococcus infection (Case II. of our series).

In Anders'² 1780 cases there were but four instances of acute nephritis.

The frequency of the occurrence of *chronic nephritis* as a result of malarial fever is a point about which different opinions have been held.

Lenz³ and Rosenstein⁴ both believed malaria to be a frequent cause of chronic nephritis. Bartels⁵ was also a strong upholder of this idea.

Hertz⁶ asserts also that cases of acute nephritis in malaria may pass into chronic diffuse nephritis, a sequence which is recognized by many observers.

McLean⁷ says: "I can confirm from personal observations Dr. Parke's remark that chronic Bright's disease is a consequence of ague. Many 'old Indians' who have suffered from malarial fevers die of this disease."

Kelsch and Kiéner⁸ have described in detail the changes in chronic as well as in acute nephritis occurring in old "febricitants." They describe two main varieties of kidney as met with in chronic paludism: (1) the congested kidney; (2) the atrophic kidney.

1. The engorged kidneys are increased in size and weight, and of firm consistency. The surface is smooth, the color deep red, the congestion being particularly marked in the pyramids. Owing to the extensive congestion of the vessels interstitial hemorrhages or the escape of blood into the tubules may occur. There is a marked granular degeneration of the tubular epithelium, while desquamation is common. Hyaline casts may be found.

2. The atrophic kidneys are small, the surface is irregular, the capsule adherent, the consistency increased. The color is usually of a maroon or mahogany tinge, and often there is a blotchy appearance. Small

¹ Johns Hopkins Hospital Reports, 1895, vol. v. 230.

² Op. cit.

³ De diffusa nephritide chronica, præcipue respecto decursu morbi post intermittentem febrim, Inaug. diss., Gryphiae, 1865.

⁴ Path. u. Therap. der Nierenkrankheiten, Berlin, 1870, 215.

⁵ Ziemssen's Cyclopædia, Amer. edition, vol. xiv. 328.

⁶ Op. cit., p. 649.

⁷ Reynolds' System of Medicine, vol. i.

⁸ Maladies des pays chauds, 8°, Paris, 1889, 744, and Arch. de phys. norm. et path., 1882, ii. s. T. ix. 278.

cysts are common. Microscopically, alterations are to be found in the interstitial tissue as well as in the tubular epithelium. They note in conclusion that¹ "malarial nephritides have but little that is characteristic about them. We may again, however, note (1) the tendency toward hemorrhages in all forms and at all periods of the nephritis; (2) the frank character of the inflammation in contradistinction to the partly steatotic, partly sclerotic forms which gout and alcoholism give rise to so frequently with us; (3) the rarity, perhaps the absence, of amyloid degeneration, the ordinary expression of septicæmia of all sorts. Even in the cachexias the fatty and colloid degenerations of the kidneys are of a subinflammatory character and give rise to hemorrhages. They are sharply distinguishable from the lesions of the senile kidney by the wholly secondary importance of the vascular changes and notably by the absence of arterial atheroma."

Rowland² noted the frequency of chronic nephritis in the malarial regions of British Guiana.

Laveran³ in his treatise states that "acute or chronic nephritis is a fairly common complication of paludism. The nephritis has sometimes the characters of an epithelial nephritis (the urine contains albumin in great quantity, anasarca occurs and becomes rapidly generalized) or that of interstitial nephritis or of mixed nephritis; this last form is believed the commonest."

Other observers have paid very little attention to malaria as a cause of chronic renal changes. Thus it is not mentioned in Senator's⁴ work as an etiological factor in chronic nephritis.

In Anders'⁵ 1780 cases, chronic nephritis was met with in but one instance.

Bignami,⁶ in his admirable studies on the pathological changes in chronic malaria, lays but little stress on the changes in the kidneys.

Marchiafava and Bignami⁷ have described *amyloid degeneration* of the kidneys following long and repeated febrile attacks. These have been associated with the clinical symptoms and anatomical lesions of a severe chronic nephritis. Beside the affection of the vessels of small and medium size and of the glomeruli, the authors found a considerable involvement of the walls of the renal tubules themselves.

Rem Picci,⁸ of Rome, has recently published an interesting communication upon the renal lesions in malarial fever, which has come to the author's observation since the writing of this paper. He recognizes the

¹ Arch. de phys. norm. et path., 1882, s. ii. T. ix. 494.

² The British Guiana Medical Annual and Hospital Reports, Demerara, 1892, p. 41.

³ Op. cit., p. 213.

⁴ Die Erkrankungen der Nieren. Wien, 8^o, 1896 (excerpt from Spec. Path. u. Therap., herausgegeben v. Nothnagel).

⁵ Op. cit.

⁶ Boli. d. R. acc. Med. d. Roma, 1893, xix. 186.

⁷ Riforma Medica, Ann. vii, vol. i. 571.

⁸ Policlinico, vol. v-m., 1898, 197.

fact that a malarial infection may be the cause not only of simple albuminuria, but of extensive renal changes, although such cases are rare. Malarial nephritis occurs more commonly in the fall than in the spring, and is particularly common in young individuals. It occurs in both the severe and the mild forms of the disease, and is no more frequent apparently in the former than in the latter.

The attack is usually mild and of favorable outcome, but it may be severe, and in some instances passes into a chronic form. The symptoms of nephritis appear not only during the malarial attack but sometimes develop after the disappearance of the acute symptoms of the infection. These cases Rem Picci has termed "post-malarial." Amyloid degeneration is occasionally met with. The exciting cause of malarial nephritis is believed by the author to be the elimination of the toxic products of the infection.

Thus, in summary it may be seen that the association of albuminuria with malarial fever has been generally recognized, but its frequency variously estimated, the general tendency being toward the idea that even in severe forms it is not so common but that the early appearance of albuminuria may be regarded as a valuable point in the differential diagnosis between this disease and yellow fever.

And while acute nephritis dependent upon malarial infection is well understood to occur, there are no existing statistics tending to show its relative frequency as compared with nephritis in other acute infections. The same may be said with regard to the more chronic renal changes.

It has, therefore, seemed advisable to us to analyze our cases of malarial fever occurring during the last eight years, with a view to determining the following points:

1. The frequency of albuminuria in malarial fever as compared with some other acute infections.

2. The frequency of acute nephritis in malarial fever.

3. The possible influence of malarial fever in the production of chronic renal changes.

Albuminuria.

During the past eight years 758 cases of malarial fever have been treated in the wards of the Johns Hopkins Hospital. In 691 of these cases there are records of examination of the urine:

Albumin was present in 321 instances	46.44 per cent.
There was no albumin in 370 instances	53.5 "

In the great majority of cases the albumin was present as a small trace. Casts of the urinary tubules were found in 121 cases—17.5 per cent.

The proportion of cases in which albuminuria was present varied materially, as might have been expected, according to the type of fever,

TABLE OF 691 CASES IN WHICH AN EXAMINATION OF THE URINE
 WAS RECORDED.

Tertian fever—344 cases:

Albumin present in	. . . . .	132 cases—38.3 per cent.
No albumin	"	212 " 61.6 "
Casts	"	40 " 11.6 "

Quartan fever—8 cases:

Albumin present in	. . . . .	4 cases—50.0 per cent.
No albumin	"	4 " 50.0 "
Casts	"	3 " 37.5 "

Regularly intermittent fevers (tertian and quartan)—352 cases:

Albumin present in	. . . . .	136 cases—38.6 per cent.
No albumin	"	216 " 61.3 "
Casts	"	43 " 12.2 "

Æstivo-autumnal fever—283 cases:

Albumin present in	. . . . .	165 cases—58.3 per cent.
No albumin	"	118 " 41.6 "
Casts	"	70 " 24.7 "

Combined infection (tertian and æstivo-autumnal)—26 cases:

Albumin present in	. . . . .	11 cases—42.3 per cent.
No albumin	"	15 " 57.6 "
Casts	"	7 " 26.9 "

Cases of uncertain type—30 cases:

Albumin present in	. . . . .	9 cases—30.0 per cent.
No albumin	"	21 " 70.0 "
Casts	"	1 " 3.3 "

It thus becomes evident that albuminuria has occurred in nearly one-half of all the cases of malarial fever treated in the hospital. In the regularly intermittent fevers, tertian and quartan, the proportion of cases of albuminuria was 38.6 per cent., while in the æstivo-autumnal infections, the majority of all cases, 58.3 per cent. showed albumin in the urine. The large percentage in æstivo-autumnal fever is not remarkable when one considers the many other clinical evidences of the greater malignancy of infections with the æstivo-autumnal parasite.

Our statistics show, however, a rather strikingly large proportion of instances of albuminuria in all types. They can scarcely be compared to those of Anders, who has used the qualifying term "marked." The percentage is, however, five times as large as that of Atkinson,¹ who found albuminuria in 9 per cent. of 121 cases.

Particularly conspicuous is the high percentage of albuminuria among the cases of æstivo-autumnal fever. It is in the more severe infections with this variety of parasite that the so-called remittent and pernicious fevers most commonly occur, and in these more severe attacks it would be but fair to assume that the percentage of cases showing albumin would be yet larger than that shown by our figures. And yet it is in just these cases that, at times, the question of a differential diagnosis between yellow fever and malarial fever is believed by some authors to hang upon the presence or absence of albumin in the urine.

¹ Op. cit.

It may be interesting to compare the frequency with which we have found albumin in the urine of patients with malarial fever with our own statistics and those of others with relation to certain other of the acute infectious diseases.

Typhoid Fever. Here we may use our own statistics. In 389 cases of typhoid fever Hewetson and Osler¹ observed albumin in 303 instances, or 78 per cent., and casts in 164, or 42.2 per cent.

Scarlet Fever. The frequency of albuminuria in scarlet fever has been variously estimated. Miller,² Patrick,³ Steiner,⁴ and Gubler,⁵ as well as Lecorché and Talamon,⁶ believe that albuminuria is practically always present during the febrile period of the disease. Sée⁷ estimated that it was present in more than one-half the cases, Haidenheim⁸ in 80 per cent. Cadet de Gassicourt⁹ found albumin in 21 out of 65 cases, but believes these figures to be too high. Barthéz and Sanné¹⁰ believe it to be relatively rare, while Vogel¹¹ found it in two instances out of 50 or 60 cases, and Thompson¹² in 40 out of 112 instances.

The later albuminuria, that occurring during convalescence, was observed in 30 per cent. of the cases of Cadet de Gassicourt, and in 55 out of 112 cases studied by Thompson.

Caiger¹³ found albuminuria in but 7.69 per cent. of 4015 cases in the London Fever Hospital; he asserts that the frequency of this condition is much less than is generally supposed. He omits, however, from his statistics those cases in which "but a faint and transient cloud of albumin was noted for less than three days."

My friend, Dr. McCollom, has very kindly sent me the results of the examination of the urine in 100 cases of scarlet fever in the Boston City Hospital:

$\frac{1}{4}$ to $\frac{1}{8}$ per cent of albumin	.	.	.	.	.	.	.	4 cases.
$\frac{1}{10}$ per cent. " "	.	.	.	.	.	.	.	1 case.
Large trace " "	.	.	.	.	.	.	.	1 "
Trace " "	.	.	.	.	.	.	.	4 cases.
Slight trace " "	.	.	.	.	.	.	.	14 "
Very slight trace " "	.	.	.	.	.	.	.	15 "
Slightest possible trace of albumin	.	.	.	.	.	.	.	49 "
No albumin	.	.	.	.	.	.	.	12 "
								100 cases.

¹ Hewetson: Johns Hopkins Hospital Reports, 1894, iv. 113. Osler: Ibid., 1895, v. 281.

² Lancet, 1849, il. 1, 57, 113, 197, 231, 524, 685.

³ Cited by Guinon, art. Scarlatina, in Traité de Méd., Charcot, Bouchard, Brissaud, 8°, Paris, 1892, T. ii.

⁴ Compendium der Kinderkrankheiten, 3d ed., 8°, Leipzig, 1878.

⁵ Dict. encycl. des sc. méd., Paris, 1869, il. 476.

⁶ Cited by Guinon, op. cit.

⁷ Le Moniteur des Hôp., 1858, 659.

⁸ Cited by Barthéz and Sanné.

⁹ France Méd., Paris, 1881, il. 388, 400.

¹⁰ Traité clin. et prat. des maladies des enfants, 3me éd., Paris, 1891, 124.

¹¹ Quoted by Barthéz and Sanné.

¹² Med. Chir. Transactions, 1887.

¹³ Article, Scarlet Fever, in A System of Medicine, etc., edited by T. Clifford Allbutt, London, 1897, vol. il. 151.

Diphtheria. The frequency of albuminuria in diphtheria is also variously estimated. Sée¹ believed it was present in one-third or in one-half of all cases; Maugin and Bergeron² assert that it occurs in the majority of instances. Bouchut and Empis³ estimate its frequency at 66.7 per cent., as does also Ebert.⁴ Smith⁵ found it present in 24 out of 62 cases, or 38.7 per cent., but believes that the proportion is probably greater, inasmuch as albumin was often missed, owing to the transient character of the symptoms. Sanné⁶ found albumin in 224 out of 400 cases, or 54.5 per cent.

By far the most satisfactory statistics are those of McCollom.⁷ Out of 633 cases of diphtheria albumin was present in 57.7 per cent. and absent in 42.3 per cent.

If we compare our statistics of malarial fever with those of typhoid fever, we find that malaria stands well behind the former affection in the frequency with which albuminuria is observed.

The figures show:

	Malarial fever.	Typhoid fever.
Percentage of cases of albuminuria	46.4	78
Percentage of the cases in which tube-casts were found	17.5	42.2

This is not remarkable when one considers through how long a period the kidneys of a patient with typhoid are subjected to the influence of the toxic products of the infection, as well as to the continued high temperature.

If, however, one compare the percentages in the more severe æstivo-autumnal fevers, the figures approach one another more closely.

	Æstivo-autumnal fever.	Typhoid fever.
Percentage of cases of albuminuria	58.3	78
Percentage of cases in which casts were found	24.7	42.2

Scarlet Fever. From a consideration of the varying estimates above mentioned, it would appear that albumin is in all probability present in at least one-half the cases of scarlet fever. McCollom's figures indicate a still higher percentage. It is, perhaps, possible that in a certain proportion of the 49 per cent. of cases where the "slightest possible trace of albumin" was found, the minute quantity would have passed unobserved with ordinary routine methods of urine examination.

It may be fair to compare Caiger's estimate, where those cases showing "a faint and transient cloud lasting less than three days" were omitted, with our cases in which casts were found.

Such a table shows: *Caiger's statistics of the frequency of albuminuria in scarlet fever*, 7.69 per cent.

¹ Op. cit.

² *Moniteur des Hôpitaux*, Paris, 1858, vi. 1035, 1043, 1051, 1064.

³ *Gaz. des Hôp.*, 1858, 524.

⁴ Cited by Oertel, *Ziemssen's Cyclopædia*, American edition, i. 603.

⁵ *Keating's Cyclopædia of Diseases of Children*, i. 626.

⁶ *Traité de la diphthérie*, 8°, Paris, 1877, pp. 128 et seq.

⁷ *Med. and Surg. Reports*, Boston City Hospital, Ninth Series, Boston, 1898, p. 27.

Percentage of our own cases of malarial fever in which albumin and casts were present, 17.5 per cent.

One can, however, form few conclusions from this comparison excepting that in malarial fever, at least in æstivo-autumnal fever, the percentage of cases of albuminuria is not very far below that in scarlet fever.

Diphtheria. Assuming that McCollom's figures form a fair basis for comparison we find :

	Malarial fever.	Diphtheria.
Percentage of cases of albuminuria	46.4	57.3

And this slight discrepancy in favor of diphtheria disappears when we consider æstivo-autumnal fever separately.

	Æstivo-autumnal fever.	Diphtheria.
Percentage of cases of albuminuria	58.3	57.3

Albuminuria, then, is more common in such notoriously severe acute infections as typhoid fever, scarlet fever, and diphtheria than in malaria; the difference, however, is by no means great. While occurring in only 38.6 per cent. of the regularly intermittent fevers, the frequency of albuminuria in æstivo-autumnal fever is probably fully as great as in diphtheria, and by no means so very much less than in typhoid and scarlet fevers.

Yellow Fever. While the occurrence of albumin in the urine in malarial fever cannot be compared in frequency with that observed in yellow fever, and while the amount when present is probably usually smaller, the fact that a majority of all instances of æstivo-autumnal fever in the climate of Baltimore, cases lasting but a short time and treated almost immediately by quinine, showed albuminuria, is strong presumptive evidence in favor of the idea that a considerably larger percentage of the severe pernicious cases which are most likely to be confounded with yellow fever must show this symptom. This would suggest caution in placing too great reliance upon the presence of albumin as evidence of the existence of yellow fever in a suspicious case.

It may be asked whether our figures represent the condition in the first days of an æstivo-autumnal infection. I think it may fairly be asserted that they do.

There were 96 cases of æstivo-autumnal fever in which the urine was examined within a week after the first symptoms of the infection. In the urine in these cases albumin was present in 57, or 59.3 per cent.; casts were present in 28 or 29.1 per cent.

Acute Nephritis.

Among 1832 cases of malarial fever occurring in the Johns Hopkins Hospital and Dispensary we have observed 26 instances of acute nephritis. In three of these cases there is room for possible doubt as to whether the

nephritis may not have preceded the malarial infection, though in none is this believed to have been the case. Of all these cases there were:

Instances of tertian fever	7
“ æstivo-autumnal fever	16
“ quartan fever	1
“ combined infection (tertian and æstivo-autumnal)	1
“ uncertain type	1
Total	26

These were all typical cases of acute nephritis, the majority showing œdema, while abundant albumin and numerous casts as well as blood corpuscles and epithelium were found in the urine.

In fourteen instances the complication occurred in the first attack of malaria; in eleven instances the patient had suffered from one or more previous infections; in one there was no history obtainable.

In thirteen instances the complication ended in recovery (Cases III., IV., V., VII., IX., X., XI., XII., XIII., XVIII., XIX., XXII., XXIV.). In Cases III., IV., and V. there was still a trace of albumin present on discharge. In Cases XXII. and XXIV., a dispensary patient, but one examination of the urine is recorded. In all instances, however, the general condition warranted the conclusion that the patients were on the road to definite recovery.

In four instances the complication ended in death (Cases I., II., XV., XVI.).

In nine instances the result was doubtful (Cases VI., VIII., XIV., XVII., XX., XXI., XXIII., XXV., XXVI.).

Fatal Cases. The four fatal cases include the three instances in which some doubt may be held as to the true malarial nature of the nephritis, Cases II., XV., and XVI.

In Case II. there had been a history of œdema and bloody urine for several months, while regular chills had been noted but three weeks. The patient, however, had throughout this period been working in an extremely malarious district at the most dangerous time of the year. It is improbable that his malaria was acquired in December; far more likely that the infection occurred earlier in the season. He was a dull, stupid negro, and experience has shown us that a clear history of the time of onset of a malarial infection is often very difficult to obtain in such instances.

In Case XV. the clinical observation was unsatisfactory. Death occurred in coma, the breath having a urinous odor and the urine containing 0.25 per cent. of albumin; the illness apparently began sharply with a malarial infection two weeks before. The record of the examination of the urinary sediment, however, was unsatisfactory.

Case XVI. was one of characteristic acute nephritis which took on a chronic course, resulting fatally seven months after the onset. The patient had been living in a malarious district, and had had chills and

fever for a month and a half before entry, associated with anasarca, ascites, and evidences of acute nephritis. Edema of the feet, however, was said to have been noticed for a month before the onset of the chills. In this case there is also a history of scarlet fever (without dropsy) six years before. It is our belief that in the absence of other causes, all three of these instances were true malarial nephritis. It is but fair, however, to point to the possibility that another view of the matter may be taken.

In Cases XV. and XVI. autopsy was not permitted.

Case I. was an instance of pernicious fever, in which death was due to the acute infection rather than to the nephritis. In Cases I. and II. the anatomical changes have been excellently described by Dr. Barker.

Histories of four fatal cases :

CASE I. *Pernicious malarial fever; æstivo-autumnal infection; acute nephritis; death; autopsy.*—No. 1769. J. B.; male; aged thirty-four years; entered the hospital on September 9, 1890, complaining of fever, weakness, headache. The patient has been sleeping on the ground in a very malarious district. For three days he has complained of great weakness and continuous vomiting. No further history is obtainable.

Physical Examination. The patient is very weak and tremulous; tongue coated; thorax negative; spleen palpable; pulse 104; temperature 101°.

Blood. *Æstivo-autumnal* parasites; hyaline amœboid bodies in great numbers.

September 11th. The temperature rose this evening to 102°. No great change in the condition.

12th. The patient seems better to-day; vomiting is less frequent.

Treatment. Quinine, .325 (gr. v) three times a day.

On the 13th and 14th there was no vomiting, but the patient complained of great weakness. On the evening of the 15th the patient passed into a peculiar condition. He became drowsy and dull, and was aroused only with great difficulty. He was restless and uneasy, turning and tossing the clothes about. Occasional vomiting. Throughout the night of the 15th the patient was restless and there was hiccough. The temperature, which had been normal since the 12th, fell to a subnormal point. The vomitus during the night was tinged with blood. On the morning of the 16th the patient was catheterized, 1500 c.c. of urine being obtained. The examination showed a specific gravity of 1010; a moderate quantity of albumin. The sediment contained many casts, chiefly granular and hyaline, though partly epithelial casts were not uncommon.

At four o'clock in the afternoon the temperature had fallen to 96°. The patient was very restless, cold, and dusky; growing steadily weaker, and finally unconscious, he died at 8.45 P.M.

Autopsy (Dr. Councilman). *Diagnosis:* Pernicious malaria; acute splenic tumor; malarial pigmentation of spleen and liver; hypostatic congestion of the lungs. . . . The kidneys were large and swollen, surface mottled; capsules adherent in places. On section the consistency is firm. The Malpighian tufts are prominent and congested. The medullary rays are pale, and between them the lines of vessels are

deeply reddened. No areas of opacity are visible. The cortex is distinctly, though slightly, pallid.

Microscopical Examination (Dr. Barker¹). On microscopical examination all the bloodvessels of the kidneys were found to be dilated, the veins of the pyramids being especially wide. There is irregular dilatation of the glomerular capillaries. Comparatively few parasites are present in the kidneys, although some distinct forms are visible within the veins of the capillaries. A number of phagocytic cells can be seen, intravascular phagocytes and endothelial cells. The capsules of some of the glomeruli have undergone fibrous thickening. In places the capsular endothelium is proliferated. The endothelium of the convoluted tubules is swollen and granular and there are numerous hyaline casts to be seen in the small collecting tubules. In the pyramids hæmoglobin casts can be made out.

In this instance the nephritis, as in most cases of typhoid fever, played but a small part in the clinical picture of the disease. Possibly, had the patient recovered from the acute infection, or had life been further prolonged, clinical evidence of the renal changes might have appeared.

CASE II. Malarial fever; double tertian infection; subacute nephritis; death three and one-half months after onset.—No. 5421. L. W.; male; colored; aged twenty-three years; admitted January 9, 1893. Family and personal history negative. Gonorrhœa nine years ago. Three months ago while working in a very malarious district began to suffer from frequent micturition, general œdema, and bloody urine. For three weeks has had regular tertian chills.

Physical Examination. Marked general œdema; ascites; no cardiac hypertrophy; pulse-tension not increased; spleen not palpable (distended abdomen).

Blood. The blood was not examined until after death; it then showed an extremely severe double tertian infection.

Urine. Dark amber, clear, acid; 1017; large amount of albumin. Sediment: Hyaline, granular, and epithelial casts; many epithelial cells. There were daily febrile paroxysms, the nature of which was not appreciated during life.

The urine ranged in quantity at first between 500 and 1000 c.c., diminishing gradually before death. For the last three days it amounted to but 250 to 350 c.c. The patient became enormously œdematous, and grew more and more anæmic. He was dull and stupid, but restless and uneasy. On January 26, 1893, he died.

The patient was treated throughout as a case of nephritis. A milk diet was ordered and frequent hot baths. Diuretin and digitalis were given internally.

Autopsy (Dr. Councilman). "Anatomical diagnosis: Acute malarial fever; double tertian infection; general streptococcus infection; subacute Bright's disease; malarial pigmentation of the organs; chronic passive congestion; general anasarca; infarctions of kidneys; erysipelas."

"The blood, examined fresh from the peripheral veins and various internal organs, showed enormous numbers of malarial parasites, most of them nearly full-grown, others only half-grown (tertian type), many of them enclosed within the protoplasm of large mononuclear leucocytes.

"The kidneys together weigh 400 grammes. They are both alike in

¹ Johns Hopkins Hospital Reports, v. 234.

size and general appearance. On the surfaces of each a few small, fresh infarctions with hemorrhagic margins are visible. The capsules strip off easily. The general color of the external surfaces of the kidneys beneath the capsules is yellowish-brown, marked by scattered opaque darker areas, and here and there by minute hemorrhages. The whole kidney has a rather soft oedematous feel. On section the cortex has a yellowish appearance and is rather translucent; pyramids reddened, contrasting sharply with the lighter colored cortex. In some parts of the cortex the striae are well marked, in others they are less apparent or invisible. Average width of cortex 1 cm. A small amount of fluid exudes from the cortical substance on pressure. The glomeruli are indistinct.

"Frozen sections of the kidney show a very little fat in fine droplets in the glomeruli. The epithelial cells of the tubules in the labyrinth are much swollen and are filled with fine albuminous granules and hyaline droplets. Many of the tubules are dilated and are lined by low epithelium. Casts are numerous in sections and in urine collected from the bladder; coagulated albumin is visible in the capsular spaces, in frozen sections made from a bit of kidney previously fixed in boiling water. The capsular epithelium is swollen and evidently proliferated."

The kidneys were carefully studied by Dr. Barker.¹

"*The Kidney.* An examination of many glomeruli shows considerable variation in the size of the capsular spaces. While in some instances the glomerulus almost completely fills out Bowman's capsule, the space being a mere chink, in others the latter is equal in size to one-third of the whole capsule. The space is not always empty, but may contain coagulated albumin, red blood-corpuscles and shadows, or a few mononuclear cells (desquamated epithelium). The fibrous capsules are not thickened except occasionally where an atrophied glomerulus is visible. Frequently just outside the capsule of Bowman a narrow clear space can be made out, and this may contain a few cells, chiefly polynuclear leucocytes, or even be crowded with them. In many of the capsules the capsular epithelium is evidently proliferated, the whole inside of the space being lined by nuclei with intensely staining chromatin. The glomerular capillaries vary in their size and contents; some of them are empty, others are distended. Occasionally one is seen to be plugged with streptococci. The number of white corpuscles within the glomerular capillaries also varies; they are very irregularly distributed; in some glomeruli scarcely any are present; in others, one, two, or more of the glomerular capillaries may be packed full of polynuclear leucocytes. In a section stained in methylene blue a capillary is visible plugged at one point with streptococci and crowded throughout the rest of its extent with leucocytes, with polymorphous nuclei, reminding one forcibly of the appearance of the capillary glass tubes in an experiment in positive chemotaxis. On the other hand, masses of cocci may be seen with no neighboring leucocytic accumulation. The nuclei of the polynuclear leucocytes vary in appearance: some stain sharply and take on the ordinary forms; others stain less sharply, have a blurred look, and assume bizarre shapes. The protoplasm of the polynuclear leucocytes frequently contains granules or minute clumps of granules of malarial

¹ Johns Hopkins Hospital Reports, vol. v. p. 257.

pigment, occasionally a well-formed parasite or short chains of cocci. There is some malarial pigment in the glomeruli contained within the protoplasm of mononuclear cells. The majority of the malarial parasites in the glomerular capillaries are outside nucleated cells. Here and there in specimens stained with aqueous magenta a giant spindle-shaped nucleus is visible. The lumina of the convoluted tubules are for the most part wide and are lined with rather low cubical epithelium. There are a few areas of dilated tubules, in which the lining epithelium is flattened so as to resemble endothelium. The nuclei of the epithelial cells, as a rule, stain normally, although in some swollen cells they stain feebly, and in some tubules the nuclei are shrunken and the chromatin stains more intensely than normally.

"Many of the convoluted tubules and collecting tubules contain hyaline casts; and hyaline droplets are visible within the swollen lining epithelial cells. These droplets, both the finer and the coarser, and the upper portions of the hyaline casts, stain intensely in Weigert's fibrin stain. Occasionally desquamated epithelial cells and a few red blood-corpuscles and round yellowish striped urinary concretions are to be seen within the lumina of the tubes.

"The intertubular capillaries contain enormous numbers of streptococci (methylene-blue, Weigert's fibrin stain). Many of them are dilated and completely plugged with cocci, and sometimes chains of cocci are visible in narrow pericapillary spaces. As in the glomerular vessels, some of the intertubular capillaries are crowded with leucocytes. Some of the small veins in the cortex are actually thrombosed with masses of streptococci, large numbers of malarial parasites, white corpuscles (some of which are necrotic), and pigment clumps. No bacteria other than streptococci are present anywhere in the kidney.

"In the interstitial tissue of the kidney there is a slight but evident increase in the number of the cells of the lymphoid type. There are small nodal masses of smaller and larger round cells, usually with but little perinuclear protoplasm, many of them with fragmented nuclei. These minute nodes may contain beside lymphoid cells single polynuclear leucocytes or epithelioid cells.

"Sections of the kidney treated with ferrocyanide of potassium and hydrochloric acid show an almost entire absence of cells containing hæmosiderin. Here and there, however, a little is visible within the protoplasm of the endothelium of the vessels.

"The infarcted areas of the kidney present the lesions ordinarily seen under these circumstances—anæmic necrosis and neighboring reaction. The whole of the necrotic area—glomeruli, tubules, bloodvessels, interstitial tissue—refuses to stain in the ordinary nuclear dyes, and has an increased affinity for eosin. The only nuclei which stain are those of polynuclear leucocytes which have invaded the interstitial tissue everywhere, and are accumulated in large numbers at the margins of the infarcted areas, and in the neighboring dilated bloodvessels. There is extensive nuclear fragmentation in these polynuclear leucocytes, and the most varied distortion-processes (*abschnurungsvorgänge*) of their nuclei are visible. Many of the bloodvessels at the apices and in the peripheries of these infarctions are thrombosed with streptococci, enormous numbers of malarial organisms—over one hundred of which were counted inside the lumen of one vessel—and white cells. Small bits of the kidney hardened in Flemming's stronger solution and stained with aqueous

magenta yield very instructive sections. Fine fat droplets are visible in the glomeruli and in the epithelium lining the capsular spaces. The convoluted tubules are not extensively fatty; some are entirely free from fat droplets, others show numerous smaller and larger droplets, especially at the proximal ends of the lining epithelial cells. Fine fat droplets are also visible in the protoplasm of some of the leucocytes in the vessels, and also in the smooth muscle fibres of the arteries. The desquamated epithelial cells within the lumina of the tubules contain numerous rather coarse fat droplets. The cells of the convoluted tubules in sections prepared in this way are seen to be finely granular, and the hyaline degeneration of the protoplasm is well shown. Many of them contain large vacuole-like spaces which sometimes displace the nuclei. In some of the tubes free red blood-corpuscles, polynuclear leucocytes, and malarial organisms are visible. The last named are sometimes free or lie on red blood-corpuscles, sometimes they are enclosed within cells. They are to be seen in both polynuclear and mononuclear cells within the lumina of the convoluted tubules. In one tubule, beside numerous red blood-corpuscles and shadows, four free well-formed malarial organisms and a mononuclear cell containing within its protoplasm five malarial organisms of the same stage of development can be made out. Pictures such as these were seen too often to be accounted for by technical accidents. Occasionally red corpuscles, malarial parasites, and white cells are visible within the glomerular capsular spaces."

The time at which the streptococcus infection came on is not clear.

CASE XVI. *Malarial fever; tertian infection; nephritis; uræmia; coma; death; no autopsy.*—No. 17,406. P. J., female, aged fourteen years; admitted September 26, 1896. The patient had chills and fever during six months last year. No history of other infectious diseases. Eleven days ago she began to suffer from pains in neck and legs, dyspnoea on exertion, fever, and cold sensations.

Physical Examination. The face has a pasty white color; lips pale; tongue coated. The patient is very apathetic; somewhat delirious; spleen not palpable; no œdema; breath has a urinous odor.

Blood. Extracellular tertian bodies. Leucocytosis of 21,000.

Urine. Passed involuntarily and lost.

Temperature. Subnormal.

On the 27th the patient became comatose.

Urine. Catheterized specimen; pale yellow, opaque; 1008; albumin 0.25 per cent. The sediment contains considerable pus. No casts or blood to be seen.

Despite hypodermic injections of quinine and stimulation, the patient died comatose on the 27th. Autopsy was not allowed.

This case is unsatisfactorily recorded. The author was absent at the time, but Dr. Camac, who saw the case, tells me that there is little doubt that the death was from uræmia. As to the causal influence of the malaria, there must be some question.

CASE XVI. *Malarial fever; æstivo-autumnal infection. Acute nephritis, becoming chronic; death.*—No. 17,621. I. A., female, aged fourteen years; entered October 17, 1896. Family history negative. The patient had measles and whooping-cough as a child; scarlet fever six years ago.

Has always been well and strong. She lives in a most malarious district. Two and a half months ago she began to notice slight œdema of feet and puffiness of eyes. A month and a half ago began to have chills and fever. At this time the swelling increased considerably, involving the genitalia and abdomen and becoming very troublesome. The urine was reduced in quantity and red. There was marked pallor. The chills disappeared under treatment; she had but seven or eight in all, and thinks she has quite recovered from the malaria.

Physical Examination. Marked pallor; general œdema and ascites. Heart's apex in fourth space, 8 cm. from median line. Second aortic sound markedly accentuated.

Blood. Half-grown tertian parasites.

Urine. Pale; acid; 1012; albumin, 0.5 per cent. Sediment, abundant; epithelial cells, small, round, and larger flat; hyaline, finely and coarsely granular casts; blood casts; pus cells; granular matter.

Under quinine the parasites rapidly disappeared. The temperature was normal throughout. The urine, however, was always reduced in quantity and the œdema never cleared up. The pulse throughout was of high tension; second aortic sound markedly accentuated. Uræmic symptoms, headache, vomiting, and eventually coma existed for five months, death occurring on March 20th. The albumin at times was present in as large quantities as 0.7 per cent. The patient was kept for the greater part of the time on a milk diet. Various diuretics and iron were given internally. Hot water and hot-air baths, with pilocarpine internally, were administered with only temporary effect. No autopsy was permitted.

Cases with uncertain result. In nine instances, Cases VI., VIII., XIV., XVII., XX., XXI., XXIII., XXV., and XXVI., the final outcome of the nephritis is not perfectly clear, though in the majority recovery probably occurred.

Cases XXIII., XXV., and XXVI. were observed in the dispensary, and were seen on but one occasion.

Case VI. was an instance of mild acute hemorrhagic nephritis occurring in æstivo-autumnal fever. The patient left a week after admission, feeling perfectly well, the urine containing, however, at the time of discharge, a trace of albumin, while the sediment showed occasional hyaline and granular casts and red blood-corpuscles. There was no cardiac hypertrophy; no increase in the blood tension; never any œdema.

Case XIV. was that of a man, aged forty-one years, who had suffered off and on for a month with daily chills, and for ten days with œdema of the face and extremities. The urine showed the characteristics of a mild acute hemorrhagic nephritis. Considerable improvement in the general condition occurred under quinine, but the patient had a carbuncle upon the back of the neck, and four days after entry left the hospital against advice, dreading an advised operation.

In cases XVIII., XX., and XXI., especially in the two former, there is some possibility that the process may have become chronic. These cases will be considered later.

ANALYSIS OF 26 CASES OF ACUTE MALARIAL NEPHRITIS.

From 1 to 10 years of age	2 cases.
" 10 " 20 " "	4 "
" 20 " 30 " "	9 "
" 30 " 40 " "	6 "
" 40 " 50 " "	5 "
Total	26 cases.

The figures in this table run practically parallel to those in our former statistics as to the relative frequency of malarial fever, with the exception of the slightly greater percentage of cases of nephritis between the ages of forty and fifty years. The small percentage of cases under ten years of age is, perhaps, explained by the absence of a children's ward in the hospital.

Sex :

Of the 26 cases there were males	17—65.3 per cent.
" " " females	9—34.6 "

Race :

20 of the 26 cases were in white patients	76.9 "
6 " " " negro "	23.0 "

These latter figures are striking. Of 1832 cases of malarial fever, but 82 (4.4 per cent.) were in colored patients; and yet of these few patients 6 (7.3 per cent.) developed acute nephritis, against 20 (1.1 per cent.) in 1750 whites.

These figures are quite in keeping with the clinical fact which we have learned to recognize, in this hospital at least, namely, that the colored race is much more susceptible to renal disease than the whites.

(To be continued.)

A CASE OF TWO ISOLATED CARCINOMATOUS GASTRIC ULCERS.¹

APPARENT RECOVERY AFTER EXPLORATORY CÆLIOTOMY; DEATH EIGHTEEN MONTHS LATER, FOLLOWING A SECOND OPERATION; HYPERCHLORHYDRIA TO THE END.

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It is accepted that in approximately 5 to 8 per cent. of all cases of cancer of the stomach the growth has had origin about the cicatrix of a previously existing simple ulcer or in the margin of one still open.²

¹ Read at the thirteenth session of the Association of American Physicians, Washington, D. C.; May 2, 1898.

² The carcinomatous degeneration of the margin of the cicatrix of an ulcer was first pointed out by Brinton. Rosenheim considers that from 5 to 8 per cent. of gastric ulcers become carcinomatous. *Zeitschrift f. klin. Med.*, Bd. xvii., and *Berl. klin. Woch.*, 1889, p. 47.

Cases, however, of complete transformation of an open ulcer into carcinoma, forming the *ulcus carcinomatosum*, are much more rare,¹ and are of no little interest and importance, representing, as they do, a group, the diagnosis of individual cases of which is often most difficult.

It is not to the review of the literature of these that attention is now directed, but to the consideration of a case recently encountered, about which several curious features are centred, that cause it to stand somewhat apart and render it worthy of isolated report.

The points of special interest are that eighteen months before the patient came under the writer's observation the ailment was regarded as one of carcinoma of the stomach by the surgeon, Dr. Keen, who at that time did an exploratory cœliotomy. The body of the stomach was then apparently so much involved in the presumed cancerous process that the idea of a gastro-enterostomy, previously entertained, was abandoned. What appeared to be two small glands in the omentum were removed, and one was found to be a metastatic cancerous nodule. A seeming return to perfect health followed the section, with a gain in weight at least ten pounds in excess of that ever weighed before. Dr. Keen reported the case nine months later as to all appearances completely cured. The symptoms subsequently recurred. Through the kindness of Dr. Keen, the case then, after a lapse of eighteen months, came under the writer's observation. The indications were now rather of chronic ulcer, and but for the knowledge of the removed cancerous nodule it would in all probability have been so diagnosed. No tumor existed; the stomach was normally placed and not dilated; the secretory function was normal; motility was lowered; the patient could eat and digest a hearty meal without pain or discomfort. Digestive leucocytosis was present, and pathological leucocytosis, as concerns absolute increase in number of leucocytes, absent. The skin was of cachectic hue, but the patient had lost only a minor part of the large amount of weight gained after operation, and his physical condition was relatively remarkably good. A second exploratory cœliotomy disclosed what appeared to be an entirely healthy stomach save at one point, at which was discovered a large ulcer. The patient died as a result of septic peritonitis. The necropsy showed two large distinctly isolated and widely separated carcinomatous ulcers, while the remainder of the stomach except the pylorus, which was the seat of simple fibrous thickening, was perfectly healthy.

The patient, J. H. K., was a physician, aged fifty-two years. He had never had syphilis. The family history was fair; parents and grandparents had all died of old age, with the single exception of his mother, who had succumbed to presumptive gastric cancer when sixty-

¹ According to Hemmeter (Medical Record, September 11, 1897), who has recently reviewed this subject, about twenty-eight are on record.

five years old. When in his best condition his body-weight was between 155 and 165. This last weight had, previous to the first operation, never been exceeded. He had typhoid fever at the age of twenty-two years. Diarrhœa of about a year's duration succeeded. Otherwise he had been free from illness until within the past six years; although for nearly twenty years, as was elicited on careful inquiry, he had had more or less neurotic disturbance of digestion, apparently of the nature of hyperchlorhydria, occurring chiefly when he was overworked or subjected to excessive mental strain. He was of a nervous disposition and of easily disturbed mental equipose. A hard-working country practitioner, his habits of living were irregular as concerned eating and sleeping. In December, 1890, his mother, to whom he was much attached, died. She had had symptoms of gastric cancer, the duration of which ailment was about a year. Her illness and subsequent death worried him a great deal. He lost appetite and fell off in weight and strength, and was much constipated. His ailment was regarded as a mere nervous indisposition, for which a change of air was suggested. After a few months spent in California he gained in strength and weight, and remained in fair condition for over a year. But anorexia, constipation, and a tendency to heartburn and pyrosis continued. Actual pain was apparently never present. There was, however, a sensation of distress and uneasiness, which appeared several hours after a meal, associated with heartburn. These sensations were felt in the epigastrium, and often extended posteriorly to a point immediately below the inferior angle of the right scapula. This is as he described his symptoms to me. In Dr. Keen's notes, taken just before the first operation, it is stated that he suffered from much gastric distress six years before, and "a sense of weight and pressure extending through the body from the pit of the stomach to the back at a point to the right of the spine on a level with the lower angle of the scapula." He finally abandoned practice almost entirely, devoting himself to travel. His health was now on the whole fair, until the latter part of February, 1896, two-and-a-half months before he came under Dr. Keen's observation. Then he had an attack of influenza. A sudden and profuse gastric hemorrhage occurred early in March, 1896. About a quart of blood was said to have been vomited, and a pint afterward escaped by the bowel. No aggravation of the gastric symptoms had preceded the hemorrhage, and the severe hemorrhage did not recur. But subsequently to the time of operation (five weeks) he vomited very frequently a dark-looking fluid, recognized by his attendant, Dr. Wright, of Erie, as altered blood. During the greater part of this time he was nourished almost solely by the bowel. From his former weight of 160 pounds he had fallen, during the six years, to about 130 pounds. As a result of the hemorrhage and the five weeks exclusive bowel-feeding, there was a further loss of about fifteen pounds. He was first seen by Dr. Keen, May 13, 1896. A history of the case, very much as is stated, was elicited by Dr. Keen, who also noted that his color was decidedly sallow, and that "he appeared as one who had lost much strength and was quite sick." A physical examination by Dr. Keen¹ disclosed no disease in the organs of the chest or in the kidney. No abdominal tumor could be made out, but "a distinct sense of marked resistance

¹ See Dr. Keen's paper, "Tuberculosis or Carcinoma of the Stomach; Exploratory Coeliotomy Subsequent Apparently Complete Cure." *Annals of Surgery*, June, 1897.

was apparent in the epigastrium." The debilitated condition of the patient rendered it unwise, in Dr. Keen's opinion, to make a study of the condition of the stomach by the employment of the tube. Nothing is therefore known of the condition of the secretory function at this time. An exploratory celiotomy was now determined on by Dr. Keen, "the expectation being that a cancer of the stomach would be revealed." To quote from Dr. Keen's report, just referred to:

"The operation was done May 22, 1896. There were present during the operation, Professor J. H. Etheridge, of Chicago; Dr. W. A. Edwards, of San Diego, Cal., Dr. J. J. Buchanan, of Pittsburg, and Drs. J. M. Baldy, William J. Taylor, and George W. Spencer, of Philadelphia. A vertical incision was made through the middle of the left rectus. The stomach immediately presented and was drawn out. The site of the disease was found to extend toward the cardiac extremity of the stomach, and, in order to reach it fully, the incision was extended upward to the border of the ribs. Even then it was only possible to bring about half of the stomach into the abdominal opening and almost none of the upper end. By holding up the abdominal walls, however, a view of nearly all the stomach was obtained. From the cardiac end toward the pylorus the disease extended as an infiltrating growth, both anteriorly and posteriorly, over an area extending over nearly the whole of the stomach. It did not reach quite to the pylorus. The mass was nodulated, hard, and thick, and every one present believed that it was cancerous. It was so extensive that no room was left for a gastro-enterostomy, so the abdomen was closed. Before doing so two enlarged glands in the great omentum were noted, and around one of these a ligature was cast, after which it was removed for microscopic examination.

"The patient made an uninterrupted recovery. Shortly after the operation he began to take liquid, and then semi-solid food, and soon afterward solid food, and left the hospital about three weeks after the operation, having not only recovered from the operation, but being, apparently, on the high-road to health. Dr. Keen was much surprised when, later, Dr. Kyle made the following report: 'Certain areas showed small nodules surrounded by dense fibrous tissue. The blood-vessels, while not entirely obliterated, showed thickening of the walls, especially the intima. It is undoubtedly tubercular.'

"In August, three months after the operation, the patient reported that his weight had increased to 171 pounds, and in October it had risen to 178½ pounds; his appetite, digestion, and assimilation were excellent, and he suffered no pain. In fact, his only trouble was an occasional sleepless night. His diet in August consisted of 'bread and butter, milk, eggs, potatoes, beefsteak, mutton, fish, rice, oatmeal, and fruit.' He had been taking some syrup of the hypophosphites and cod-liver oil in consequence of Dr. Kyle's report.

"Dr. Keen said that he had mentioned the names of the gentlemen present for the especial reason that those present at the operation, all men of large experience, agreed that the disease was unquestionably carcinoma of the stomach."

The apparent recovery of the patient had caused Dr. Keen, at first, to accept the view of Dr. Kyle, who first examined the removed nodule and gland, that the condition was one of tuberculosis. Later, but im-

mediately subsequent to the publication of Dr. Keen's report, and long before the patient again came under observation, sections from the supposed tubercular glands were submitted to Dr. Welch, of Johns Hopkins University, to Dr. Councilman, of Harvard University, to Dr. Adami, of McGill University, and to Dr. Prudden, of the College of Physicians and Surgeons, New York. These all reported no evidence whatever of tubercle, but that sections from the nodule showed it to be undoubtedly a metastatic cancer. Dr. Welch regarded it as scirrhus; Dr. Councilman, as adenocarcinoma; Drs. Adami and Prudden spoke of it as simply cancer. The preparations of the sections sent were regarded to be so poor that the exact character of cancer was somewhat in doubt. Dr. Councilman, however, pronounced it positively to be an adenocarcinoma.

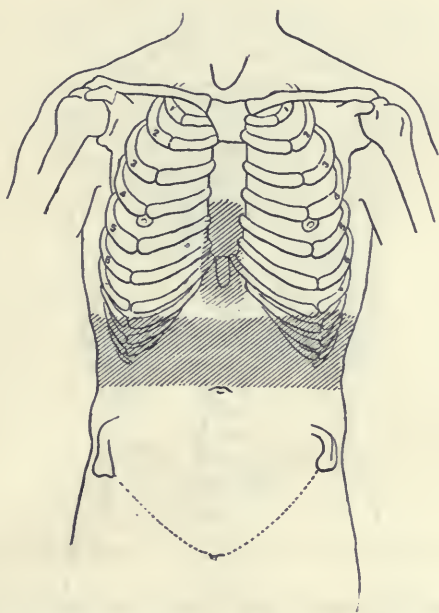
The subsequent history of the case is as follows :

The patient was referred to the writer by Dr. Keen in December, 1897, seventeen months following the operation. On getting about after the operation he had improved wonderfully in health, all gastric symptoms for a time practically disappearing. He gained rapidly in strength and flesh, so that at the end of five months he weighed nearly fifteen pounds more than he ever had before (175). During this time he had not resumed practice, but took every care of his health. After he had held this maximum gain about five months he began to lose weight without assignable cause. He had no gastric symptoms during this time; no epigastric distress, sour stomach, or nausea. He had, as was common with him for a number of years, but little appetite, and slept badly, and he was considerably disturbed by cramps in the calf muscles. He now spent several months in the mountains, and in September, 1897 (sixteen months after the operation), he returned to his home feeling in very good health and weighing 166 pounds. Shortly after this (October, 1897) gastric symptoms reappeared. These were nausea and occasionally a tendency to vomit if he ate very heartily. Heartburn or pyrosis was never evident. A regurgitation, which he described as "cold sweet water," occurred once or twice weekly. Because of loss of appetite he has lately been living largely on milk punches. About the middle of October, 1897, he began to feel gastric pain, and with its appearance a rapid drop in weight occurred (twenty-six pounds in two months). The pain was in the region of the sternum, in the back, and in the epigastrium. The sternal pain occupied a space from mid-sternum to a distance midway between the tip of the ensiform appendix and the umbilicus, and about three inches in breadth. (Fig. 1.) This pain he describes as most prostrating. He regarded it as intimately related in characteristics to a dorsal pain of most annoying character, the situation of which was, invariably, immediately to the right of the spinal column, between it and the vertebral border of the scapula, and extending from the fifth to the eighth ribs (Fig. 2). There was also a diffuse pain in the epigastrium and both hypochondria. These pains were all invariably more severe at night after retiring, especially that in the dorsal region. Otherwise the character of pain was interesting in that it was commonly felt, as in the pain of hyperchlorhydria,

at a time after food when excess of free hydrochloric acid becomes marked. Taking food, and especially meat, almost invariably relieved or removed all pain. Drinking freely of water, such as Vichy, also relieved the pain, although not to the extent that food did. The use of sodium bicarbonate, however, had no marked effect.

Unprovoked vomiting was unusual, and had not occurred for some time. He had formed a habit some weeks before I saw him of each morning drinking a pint or so of warm water containing sodium bicarbonate, and then emptying the stomach by regurgitating its contents. He could in this way relieve himself of any discomfort experienced. The rejected material rarely contained food eaten the night before. He stated there was usually a good deal of mucus, and that occasionally

FIG. 1.



The two areas shaded are those of pain, as described.

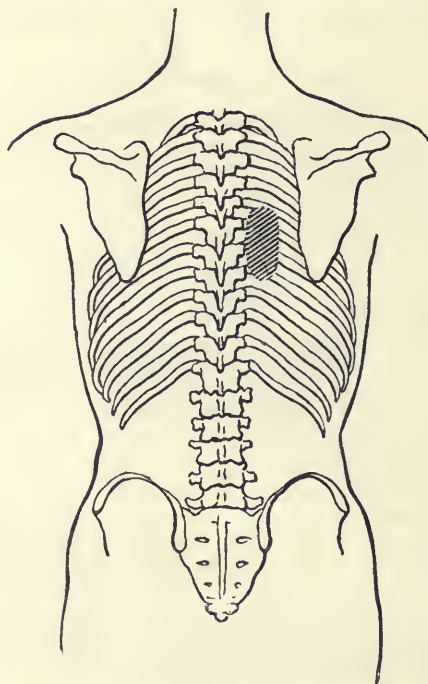
evidences of blood were noted. Inspection of the regurgitated matter showed it to contain altered blood. It was quite coffee-ground in character. He had been subject to constipation for years. The patient's skin was of cachectic hue. His general condition was really very good. His weight was 149 pounds, within ten to fifteen pounds of his best weight when in good health, and nearly thirty pounds in excess of his weight eighteen months before. During the two weeks he was under observation it was interesting that he gained seven pounds, indicating the still well-preserved recuperative power.

Physical examination of the organs of the chest revealed no abnormality; the lungs showed no sign of disease, and the heart was fairly strong and the sounds free from murmurs.

The abdominal wall displayed the healed cicatrix of the preceding

coeliotomy. Indications of local or general resistance in the stomach region, or of tumor, and abnormal glandular enlargement anywhere, were absent. The liver and spleen were normal in outline. The inferior portions of both kidneys were palpable only on full inspiration. The stomach, by ordinary percussion, by auscultatory percussion, by gaseous inflation, and by transillumination, was found to be normally placed. Indeed, by gastro-diaphany, as is here illustrated (Fig. 3), it was found to occupy a position considerably higher (three-fourths of an inch above the umbilicus) than is usual when fully distended with water, as the organ was at the time of this illumination with 1100 c.c. of water. The cause of this was subsequently made apparent (adhesions to the

FIG. 2.



The shaded area is the dorsal site of pain, as described.

abdominal wall and to liver). The transillumination with a lamp of three candle-power was perfect, the anterior surface of the organ being beautifully mapped on the abdominal wall. The scar area alone was shaded somewhat.

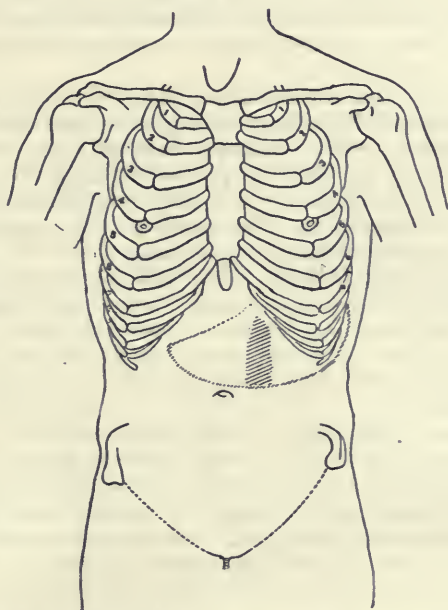
Examination of the urine showed it to be free from albumin, sugar, and casts.

For some time, as he thought that washing out the stomach would be beneficial, and as he disliked to employ the tube, his habit was to drink water and regurgitate it. He was able to report that food, other than in traces, was never present in the morning.

The examination of the stomach-contents was as follows :

December 7, 1897. Stomach washed and 500 c.c. of rather thick oatmeal gruel, flavored with salt, administered. Two and one-quarter hours subsequently, 300 c.c. were removed, practically all that remained, as was shown by subsequent lavage. Removed contents were dark red, showing on standing a copious dark sediment. The filtrate was clear. T. A. = 72; HCl = 0.2 per cent.; acid salts = 13; no lactic acid. Starch converted into erythrodextrose. Test for labzymogen: 10 c.c. milk, at 40° C.; 2 c.c. filtrate; solidification of the milk occurred within two minutes.

FIG. 3.



Transilluminated area, with shaded area of scar; stomach containing 1100 c.c. water.

8th. Stomach washed and 500 c.c. thick oatmeal gruel administered; 320 c.c. remaining in two and one-half hours. Coffee-ground sediment as before. Upper stratum, on standing, reddish hue. Filtrate not blood-stained. T. A. = 66; HCl = 0.19 per cent.; acid salts = 15. No organic acids. Erythrodextrose as before. Lab-test, under same conditions as above, positive in the same time.

Digestion test: in incubator at 40° C., egg disk approximately $\frac{1}{2}$ c.m. square, by $\frac{1}{8}$ c.m. thickness in each, 10 c.c. filtrate. One phial reinforced by an active preparation of pepsin. The disk in the phial unreinforced by pepsin had entirely disappeared in three hours; there were still faint remains of the disk in the phial in which pepsin had been added. The disks were of the same size, but, as they were not accurately weighed, that in the pepsin solution might have been a trifle larger, and, hence, caused this difference. This test was repeated with the filtrate from two other trial meals, and showed that the addition of pepsin produced no earlier disappearance of the egg disk than if it had

not been added. It showed that secretion of pepsin was in the same satisfactory proportion as the HCl.

It should be here remarked that the gruel meal on each occasion caused considerable gastric distress and pain, all of which disappeared instantly on their removal and washing out of the stomach.

9th. After lavage, a large, thick, tenderloin steak, 60 grammes of bread, 360 c.c. of milk were eaten. Four hours later 300 c.c. quite fluid contents were removed through the tube. A fair amount remained, as was shown by a subsequent lavage. Contents not blood-stained, although much retching was produced by the use of the tube. T. A. of filtrate = 151; HCl = 66. The digestion test was as above stated.

13th. The same meal taken as on December 9th. Removed at the same interval 300 c.c. No blood; contents of natural appearance. T. A. = 144; free HCl = 72.

It is noteworthy that, as remarked, while with the gruel meal gastric distress was always felt, relieved only by the removal of the meal, and subsequent washing, not the slightest trace of pain or discomfort was experienced during the digestion of the full meal of steak, bread, and milk. During the two weeks he was under observation this was found to be invariable in many trials. He could eat and digest with relish and freedom of symptoms a steak of good size.

Blood examination, December 9th. Red blood-corpuscles, 3,528,000. Hb. 46. This examination repeated later gave practically similar results. In the morning, fasting, leucocytes, 5940. Three and a quarter hours after a large tenderloin steak, milk, and bread, the leucocytes count was 7700; three-quarters of an hour later the count repeated was 8000.

Second day's examination. Nothing save oatmeal gruel had been taken, leucocytes, 6500. Four hours after a large tenderloin steak, bread, and milk, the count was 9000. These examinations were very painstakingly carried out, and may be regarded as entirely accurate. They show absence of pathological increase in the number of leucocytes, and the presence of a normal digestive leucocytosis. A differential count (1350 leucocytes) gave interesting results:

Polymorphonuclear neutrophiles	79.00 per cent.
Small lymphocytes	13.63 "
Large lymphocytes	3.46 "
Transitional leucocytes	2.42 "
Eosinophiles	1.49 "

This showed a pathological condition in the relative proportions of the leucocytes despite the absence of an increase in the total count, which on this occasion was 6500.

After this outlined study of the case, the opinion was given that the original trouble had been a long-existing hyperchlorhydria; that this, in all probability, had some years back been succeeded by ulcer, and that the ulcer had at least two years before undergone carcinomatous degeneration. Of course, this last statement would have been impossible but for the knowledge of the removal of the metastatic nodule. Indeed, but for this, the diagnosis of cancer itself at this time, in view

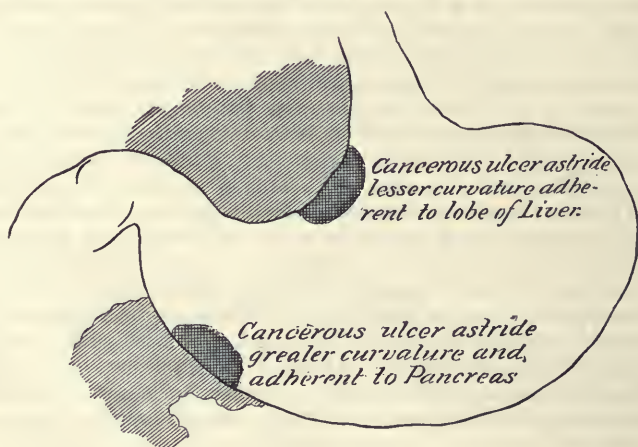
of the history of the case since the operation, would have been seriously in question. The growth was regarded as being in the body of the stomach, not encroaching on the pylorus. The diminished motility was presumed to be due to weakness of the musculature, through carcinomatous infiltration of the stomach wall. To this opinion I had Dr. Keen's concurrence. The patient placing himself in our hands, a second exploratory cœliotomy was advised, as at least offering a chance of again temporarily arresting the progress of the cancer. It was, moreover, hoped that an opportunity might be afforded for an excision of the growth, or, indeed, of a part or the whole of the stomach, should indications of external metastasis not be present.

Second operation by Prof. Keen, December 23, 1897. The anterior wall of the stomach was found to be extensively adherent to the abdominal parietes over a large area. On incision of stomach, its interior, as far as could be seen at first, presented a healthy appearance. Its wall was thinner than normal, but the mucous membrane everywhere looked normal. Palpation revealed no thickening anywhere except posteriorly and superiorly near the œsophagus, at which point a circular hard ridge of some size could be felt, and afterward was seen. This mass appeared to be a very large ulcer, with elevated callous edges. A small clipping from the edge was removed for microscopic examination. The ulcer was too close to the diaphragm and too far from the incision to permit of its removal, or of the removal of the stomach itself, because of the extensive adhesions. It was concluded to establish a duodenal fistule to permit of feeding in this way, so that, as is remarked by Dr. Keen in his notes, "If the ulcer be a non-malignant one it would heal within two or three weeks; if malignant, the rest to the stomach would, at least, do no harm." The patient, unfortunately, after the first few days did badly. Obstinate hiccough appeared; the external wound failed to heal, and he succumbed finally, eighteen days after operation, to a septic peritonitis.

The necropsy was performed by Dr. Keen eighteen hours after death. Through a misunderstanding, the body had not been placed on ice, and was already somewhat advanced in decomposition. The whole external wound gaped, with protrusion of stomach and intestine. The peritoneal cavity contained considerable pus. The heart and lungs were healthy. The liver was somewhat enlarged and pale; no evidence of metastasis here or in the peritoneum could be found. Spleen and kidneys appeared healthy. The stomach was normally placed and undilated. It was adherent to the abdominal wall, and superiorly, through the entire length of the lesser curvature, to the under surface of the left lobe of the liver, and posteriorly, at the base of the lower ulcer, to the pancreas. The pancreas appeared normal, and microscopic examination subsequently disclosed that it was so. Section of the stomach showed some softening of its walls due to post-mortem changes. Two large and entirely isolated ulcers were now noted. One, the nearest edge of which was $1\frac{1}{2}$ cm. from the cardiac orifice, was astride the lesser curvature, with the larger portion toward the posterior wall. It was adherent by its base to the inferior surface of the left lobe of the liver. This ulcer was in the largest diameter $8\frac{1}{2}$ cm. and transversely 6 cm. It

was of ovoid shape, with crater-like raised thickened edges. The margins were especially prominent on the portion nearest the cardia; here the edge measured in one part $1\frac{1}{2}$ c.cm. The floor of the ulcer was indurated, smooth, and depressed, and adherent to the left lobe of the liver. The second ulcer was situated astride the greater curvature, 7 c.cm. from the pylorus. It was of circular outline, with thickened, elevated, sloping edges, like the first described, and with a slightly excavated, considerably indurated centre. This ulcer was adherent to the adjacent part of the pancreas. It measured 5 cm. in length by $4\frac{1}{2}$ cm. in breadth. The edges of both ulcers were œdematous, hemorrhagic, and somewhat polypoid. Immediately surrounding the ulcers the stomach-wall was somewhat indurated, but this was not evident for any distance. There was apparently no connection between the two ulcers, which were widely separated, as is shown in the accompanying cut and in the photographs.

FIG. 4.



The lumen of the pylorus was narrowed through fibrous and muscular thickening of its wall. It admitted with difficulty only the tip of the index-finger.

The specimen was first given to Dr. A. O. J. Kelly, to remove portions for microscopic examinations. Subsequently portions of the growths were sent by Dr. Keen to Drs. Welch, Councilman, Adami, and Prudden.

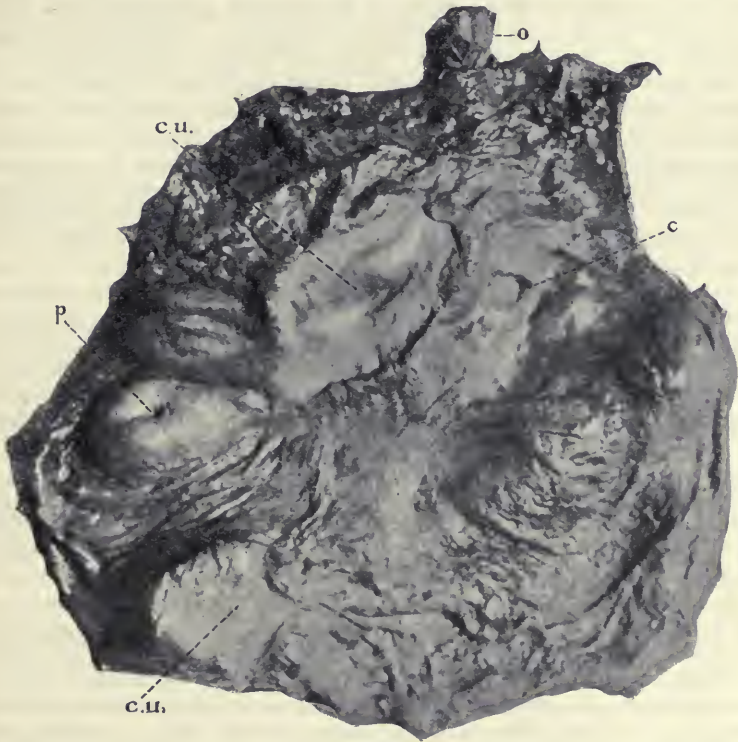
Dr. Kelly's report is as follows :

Microscopical Examination. The specimen had been placed in alcohol, but is in a very poor condition. Some areas are in a state of putrefaction and do not permit of a careful study of histologic details. This is especially true of the larger ulcerated area situate on the posterior wall toward the lesser curvature. The smaller ulcerated area situate at the posterior-inferior region toward the greater curvature is in a fairly good state of preservation.

Sections through the edge of this latter ulcerated area reveal a carcinomatous new-growth arising from the mucous coat, implicating the

latter, and also the submucous, the muscular, and the subserous layers of the wall of the organ. The mucous and submucous coats are entirely replaced by the new-growth; the muscular and the subserous are also considerably invaded and to a less extent replaced. The growth consists of cells arranged in alveoli and surrounded by a connective-tissue stroma. The alveoli, which pervade the tissues in all directions, vary greatly in size and shape. For the most part they are elongated and narrow. Others are much wider and very irregular. The cells are of distinctly epithelial type. They commonly line the alveoli, leaving a central lumen, which is in some places free, in others more or less filled

FIG. 5.



C. Cardia. C. u. Carcinomatous ulcer. O. Œsophagus. P. Pylorus bulged into the stomach in order to show the thickening and narrowing.

with detritus. Other alveoli, in addition to being lined by the cells, are completely filled by them. The cells are predominatingly high-cylindrical in shape, especially those which line the alveoli and leave a clear lumen. Other cells constituting the periphery of solid nests of cells appear more cubical. Still others, and all situate toward the centre of the alveoli, are polymorphous. The cells reveal distinct nuclei, which stain readily; those of the cylindrical cells being situate toward the base of the cells. Nucleoli are also discernible. There are at present a few karyokinetic figures which are generally hyperchromatic. Many

of the cells, especially those situate toward the centre of the nests, reveal various retrograde metamorphoses. The stroma, which consists of fully developed fibrillar connective tissue, varies considerably in different regions. In places it is abundant, in others scanty. Its nuclei present some karyokinetic figures, and the tissue itself is the seat of considerable round-cell infiltration, which latter exhibits many evidences of retrograde changes. The bloodvessels, particularly the larger ones, manifest, for the most part, thickened walls. Toward its free surface the neoplasm is markedly necrotic, and this process is complete at the central area of ulceration, where it extends to and implicates the muscular coat of the stomach. The latter is markedly hyperplastic. This, together with the fibrous overgrowth, mainly of the submucous coat, and the tumor-mass itself, occasion the marked thickening and polypoid condition of the edge of the ulcerated area. Away from the seat of ulceration there is a gradual transition from the tumor-alveoli to apparently normal gastric tubules. There first occurs a diminution of the obviously neoplastic alveoli, then a succession of irregular gastric tubules, and finally apparently normal tubules. Nests of cancer-cells also invade the muscular coat for a short distance from the ulcerated edge. These transitional stages, however, apparently do not implicate more than 1 to 1.5 cm. of the stomach-wall beyond the ulcerated edge. A section 2 cm. from this edge fails to disclose any noteworthy deviation from the normal.

Sections through the edge of the larger ulcerated area, situate toward the lesser curvature, reveal conditions which, as far as can be definitely determined in view of the decomposed state of the specimen at this region, are entirely analogous to those already detailed in connection with the smaller ulcerated area. The alveoli, however, are in many instances much larger, and the cells arranged much more irregularly. In the deeper layers of the stomach-wall there are a few cystic spaces lined with cylindrical epithelium.

Sections through the pylorus reveal it to be 1 to 1.2 cm. in thickness. Both the muscular and the fibrous layers of the wall are implicated in this overgrowth. There is no carcinomatous invasion of this region. Sections from two areas between the two ulcerated surfaces fail to reveal any evidences of carcinomatous alteration. The structures here present no especial deviations from the normal. The same is also true of sections from a region near the pylorus between the ulcerated areas.

Diagnosis. Double ulcerated adenocarcinomas of the stomach. Each ulcerated area singly considered presents no especial deviations from that type of carcinoma of the stomach of which these are instances. The interest in the specimen centres in the fact that in the same stomach there are found two carcinomas apparently unconnected with each other. There is no diffuse carcinomatous infiltration of the wall of the stomach, and aside from the marked thickening of the pylorus and about the ulcerated areas there is no especial implication of the fibrous connective tissues, certainly no diffuse pathological alteration of this structure.

The others, except Dr. Prudden, reported similarly, that sections from the portions of the two ulcers submitted showed them to be ulcerated typical adenocarcinomas. Dr. Prudden briefly reported that the growths were carcinomatous. The specimen had not been well pre-

served when the portions were subsequently sent to the others. Dr. Welch, in his report to Dr. Keen, after remarking on the badly preserved condition of the specimens sent him, which made study of them somewhat difficult, said that the essential points could be determined. There could be no question as to cancer and its type, and that a careful search revealed no distinct evidences of disease for a distance of much more than 1 cm. beyond the ulcers.

There are several features in this case of very special interest. The early history left little doubt concerning the existence of a long-standing gastric neurosis with associated hyperchlorhydria. That one or more gastric ulcers should appear in a subject of chronic hyperchlorhydria, debilitated by grief, overwork, and inanition—induced both by these causes, as by total anorexia, superadded to long-existing indigestion—cannot be a matter of surprise. Nor could it that a simple peptic ulcer should subsequently be the seat of carcinomatous transformation. Such cases, though not numerous, are on record. The features which, however, are most interesting about the case are as follows: The apparent extensive disease of the body of the stomach at the time of the first operation; the apparent recovery of the patient and the surprising increase in weight to a point beyond that ever reached in health, and its maintenance for so long a time in one then the probable subject of two separate carcinomas, which had already given rise to a nodular metastasis in the omentum; eighteen months subsequently the fairly good physical condition; the really small loss from the weight usual in health—this was in a measure explained by the remarkable preservation of the digestive condition, which in itself was noteworthy; the freedom from pain when the functions of the stomach were taxed to their utmost, as in the digestion of a heavy meal of proteids; the existence of two unconnected cancerous ulcers in the stomach. Also noteworthy was the presence of a digestive leucocytosis with absence of a pathological increase in the number of leucocytes.

In view of the finding at the time of the second operation, and the post-mortem revelations—the practical limitation of the disease to the two cancerous ulcers—the condition noted by Dr. Keen and observed by others present at the time of the first operation seems quite inexplicable. The only attempt at an explanation is that there must have occurred during the whole time the stomach-wall was exposed a tonic contraction of this viscus, throwing it into folds, and thus originating the nodular condition simulating organic disease noted. Although this seems improbable, and it is, moreover, unlikely that Dr. Keen's years of anatomical and surgical experience, rendering him so familiar with the appearance of the healthy and diseased stomach, would have permitted him to be deceived, no other explanation is at hand. For the fact remains that no evidence of gross or minute departure from the

normal could be found to exist in the stomach-wall save at and immediately about the site of the ulcers. But if one with the extensive experience and keen powers of observation of the surgeon named could be so misled, not to speak of the others present who were similarly led astray, it indicates the extreme caution necessary in forming a judgment as to the condition of the stomach concerning presence or absence of a growth without an incision into that viscus.

The temporary entire subsidence of symptoms with decided increase in weight is occasionally noted after mere exploratory operation in cases of cancer of the stomach.¹ While temporary removal of symptoms after a gastro-enterostomy, in cancer producing obstruction of the pylorus, may be readily enough understood, the same after a mere exploratory section, if a causal relation can be traced, is in itself mysterious. I am unaware of any case similar to my own in which actual *apparent recovery* followed, the patient *remaining so long free from symptoms*. The explanation why a mere exploratory section in which the involved organ is not disturbed should be so promptly followed by cessation of symptoms and decided and long-continued general improvement in health as to indicate some relation between the operation and improvement, is not at hand. The quite common occurrence of marked amelioration in symptoms, if not actual removal of the disease-process in tubercular peritonitis, following a mere exploratory section, is well known. Apparently, also, though it has been rarely noted, an extensive syphilitic gummatous formation in the liver may, without the employment of mercury or the iodides, be influenced in the same manner—as in a case reported by Stengel (see *Annals of Surgery*, June, 1897, discussion on Dr. Keen's paper). More frequently than the latter, but immeasurably less common than the former, are the observed cases in which so great an amount of symptomatic improvement has occurred following a simple coeliotomy in gastric cancer as to indicate the existence of a direct active relationship between the operation and improvement. Yet these last are not known to be cases in which more than retardation of the growth was produced. We have no knowledge as to actual, partial, or complete disappearance of cancer of the stomach. It can only be said that such an occurrence is theoretically not impossible, if for no other reason, in view of the occasional observed disappearance of cancer of the external parts, such as epithelioma, during the administration of full doses of arsenic. That in the case under observation a growth more extensive than was found post-mortem had

¹ I speak here of *entire* subsidence of symptoms. I believe there is no authentic instance of total disappearance of all gastric symptoms with considerable gain in weight, the whole maintained for some months, in a case of well-developed cancer of the stomach treated medically. It is true that short periods of improvement often occur in cases under no special treatment, and that marked amelioration will often follow resort to the tube. But even in these last cases the symptoms never entirely disappear, nor is the gain in weight extensive or long held.

previously existed, the histological examination failed to reveal evidence. If carcinoma could be regarded as a germ disease, the likely explanation of cessation of growth and the occurrence of systematic improvement as the result of section in many cases of tubercular peritonitis—that of Kischenski—might be applicable here: that the result is due to a post-operative leucocytosis. If this were so, then it might be thought that the administration of nucleins would give similar results in cases of carcinoma in which there is yet at hand a fund of recuperative power. The nucleins, however, produce a physiological and not a pathological leucocytosis, the increase not being, as is usual in the latter, in the polymorphonuclear leucocytes, but, to a similar degree, in the young cells.

As factors assisting whatever gave the original impetus to the improvement in the case were the vigorous recuperative power presumed to be possessed by the patient, the well-preserved digestive function, and the freedom from involvement of the apertures of the stomach in the cancerous process. The character of the carcinoma, too, has to be somewhat considered. Although not the slow-growing form, such as schirrus, adenocarcinoma is not supposed usually to tend to rapid metastatic extension. As was remarked by Dr. Adami¹ concerning this case, "columnar-celled cancers of the stomach are puzzling growths, in that of all forms of cancer of the stomach they appear to remain for the longest period purely local, and only infiltrate very slowly." If we do not consider the presence of the growths in the stomach, evidently but an isolated metastasis had occurred at the time of the first operation.

Although nothing in the microscopic or gross appearance of the two growths permits the assertion that they were primarily simple peptic ulcers which subsequently became carcinomatous, there is every probability that this is so, from the history and from our knowledge of similar cases, and from the fact that two identical separate ulcerating cancers were found. Whether the cancerous transformation of the ulcers was simultaneous or occurred serially, the second by infection from the first, is impossible to affirm positively. The latter is, of course, very probable. Infection by continuity of structure was scarcely likely, as was shown by the histologic examinations.

Infection may have occurred from contact through the occasional approximation of the two diseased surfaces of the empty stomach, the cancerous ulcer on the superior curvature near the cardia thus inoculating the simple ulcer on the inferior curvature; or particles of growth from the first, becoming dislodged, could easily have found their way to and a resting-place on the site of the ulcer on the greater curvature.

¹ In a private communication to Dr. Keen.

One might suppose that the very active digestive secretion, presumably always manifest in this case, would have tended readily to destroy the infecting principle before inoculation could occur. But we know too little of the intimate nature of this principle, or of its power of resistance, to hazard judgment on this point. At all events, the second ulcer was probably directly infected from the other cancerous ulcer. Other instances of presumed communicability of cancer are on record, such as epithelioma of the penis from coitus in a case of cancer of the cervix.

From the situation of the growths, encroachment upon the secretory power of the stomach did not occur; the stomach up to the time of death had practically normal function. Motility was somewhat interfered with, apparently not in consequence of the growths, but because of a slowly increasing pyloric hypertrophy with connective tissue increase, likely the result of the long-continued irritant action of excessive secretion of HCl.

The preservation of a digestive leucocytosis in this case, commonly but not invariably lost in cancer of the stomach, could not be a matter of surprise. Nor could it furnish to the thoughtful observer any valid evidence against malignancy, as the explanation for its preservation here is so evident. While the absence of a digestive leucocytosis is not in itself significant of cancer, commonly noted as it is in all maladies of the stomach in which peptonization of nitrogenous pabulum and its passage into the bowel are interfered with, its presence has been held to point strongly against that affection. Recently some exceptions to the rule that a digestive leucocytosis is invariably absent in cancer of the stomach have been recorded. This is not a matter of surprise. It is rather a matter for wonder that it could be supposed that the condition for the absence of a physiological increase of leucocytes after a meal of proteids should be always the same in gastric carcinoma. With a growth involving the pylorus, especially if associated, as is usual, with a practical loss of secretion of HCl, absence of a digestive leucocytosis is to be expected. But, as in this case, with the preservation of the secretory power and fairly good motility, the ability to digest a full meal must have its usual effect upon the blood. It was more surprising that a pathological leucocytosis involving a notable increase in the number of leucocytes in the circulating blood was not evident in a case of cancer so long existing. Although a pathological leucocytosis is not as common in advanced cancer of the stomach as in cancer of other organs or parts, it is usually met with in fair degree except when the disease is in a situation to obstruct the cardia. It was especially interesting that, although an actual increase in the number of leucocytes had not occurred, a pathological leucocytosis was in reality actually present, showing itself in an alteration in the normal relation of the

varieties to each other, the polymorphonuclear elements existing in the percentage of 79. Attention, I believe, is not enough given to the significance of the occurrence of a mere relative increase of adult cells in cases in which no increase in the absolute number existed. Here 79 per cent. of polymorphonuclear leucocytes in a subject lacking in vigor, if not attributable to the occurrence of blood oozing from the sites of the cancers (the only other assignable cause evident), had its indication.

The diagnosis of a case of this sort is naturally attended with difficulty. The presence of carcinoma engrafted on an open ulcer, unless the latter has existed for a long time, has been often overlooked in life, so gradual is the merging of symptoms of chronic ulcer into those of cancer.

The diagnosis of these cases lies commonly in the recognition of a *carcinoma ex ulcere*. The ulcer has usually plainly enough preceded for a more or less long time the development of malignancy, producing the familiar characteristic symptoms. Not infrequently, however, gastric ulcer is for a long time latent. The usual symptoms may not be at all manifest. There may be practically no symptoms complained of, or those noted may consist of a simple heightening in the secretion of HCl, or those of a gastric neurosis unassociated with hyperchlorhydria may be alone manifest. The symptoms of presumptive ulcer first remarked may then be really those of the developing cancer. The case under consideration was of this sort. During the six years' symptoms were largely those of a pronounced neurosis associated with hyperchlorhydria. The gastric discomfort spoken of here was so explained, except that the uneasiness or pain occurring several hours after taking food, extending to the back, should have excited the suspicion of ulcer. No vomiting had occurred and no hemorrhage had been noted until six years had elapsed, during the whole period of which doubtless ulcer existed. The growth had then been present sufficiently long to produce a secondary distinct cancer in the stomach and a nodule in the omentum. In such a case as this, especially in the period following operation, the great improvement in the general condition, with the practical cessation of symptoms and the enormous gain in weight, would have made the diagnosis of carcinoma of the stomach very difficult. Even eighteen months succeeding operation, when the frequent appearance of coffee-ground material in the stomach-contents, usually so strongly suggestive of cancer, was evident, other symptoms pointed so strongly against that condition that its certain recognition was impossible, at least without the discovery of bits of the growth in the stomach-contents, here searched for, in the short time he was under observation, in vain. No doubt particles of the growth in a case of adenocarcinoma could eventually have been found had opportunity for any prolonged search been permitted. The diagnosis being regarded

as settled from the knowledge of the character of the metastatic nodule, the finding of cancerous particles was not necessary.

In the diagnosis of a case of doubtful carcinomatous ulcer, apart from points mentioned, the following are also to be considered: the loss of weight and the cachexia both apt to be out of proportion to what is usual in ulcer. The occurrence of constant oozing of blood, appearing as coffee-ground material in the vomit or in the wash-water, is significant of cancer rather than ulcer. Also important is the lack of decided response to the improved methods of treatment for ulcer, which usually rarely fail in prompt result in cases in which the lumen of the pylorus is not obstructed. Not long ago this, with the more or less constant presence of coffee-ground material in the vomit, led me to diagnose correctly carcinomatous degeneration in a case of chronic ulcer that had been under observation only a short time. The diagnosis was confirmed by finding a bit of the growth (an adenocarcinoma) in the wash-water. The loss of weight may not be more marked than in ulcer, especially if the ulcer be so situated as to produce pyloric obstruction. The patient, also, may be very responsive to treatment for a time, as was true in the case just spoken of and in that of the subject of this paper. The extraordinary gain in the latter after the first section, with cessation of symptoms, could not but tend to mislead. Such a gain, long retained, however, is unknown as a result of any medical treatment of cancerous ulcer.

The general question of diagnosis of carcinomatous ulcer must be deferred for fuller consideration in a second paper in which another case the writer has encountered and diagnosed in life will be described, as will be a case of chronic ulcer in a man of middle age, in whom adherent omentum caused the presence of a pyloric tumor suggestive of carcinoma. The present paper is intended merely as a report of what the writer regards as a remarkable case, worthy of isolated publication.

REVIEWS.

MORPHOLOGY OF THE CEREBRAL CONVOLUTIONS, WITH SPECIAL REFERENCE TO THE ORDER OF PRIMATES. By ANDREW J. PARKER, M.D. Journal of the Academy of Natural Sciences of Philadelphia. New series. Vol. x. Part 3.

THE publication of this work is largely due to the efforts of Dr. Dercum. The author devoted many years of his life to its preparation, but did not live to see it in print. The numerous illustrations have been most carefully prepared from photographs taken by Dr. Parker. The principal object of the paper is to draw attention to a new view of the morphology of the cerebral convolutions in primates, and to show that they are related to a symmetrical bud-growth of the cerebral hemispheres.

The conclusions are largely founded on the studies of the brains of related animals and on the embryology of the human brain. If it can be shown that the convolutions are based upon a symmetrical plan related to the structure of the hemisphere, it may have interesting bearings as regards the functions of the different portions of the cerebral cortex itself, although it is not known as yet how closely these functional districts correspond to the convolutions.

Dr. Parker believes that the fissures represent lines of retarded growth with respect to the convolutions, and, as they have a morphological significance in reference to the cell-growth of the brain, they may represent lines of structural demarcation. Several pages are devoted to the literature on the arrangement of the convolutions and fissures; the nomenclature and synonymy of the fissures and convolutions in the primates are then treated of at length.

In regard to the manner of formation of the fissures the writer believes that certain of these and of the convolutions, including the most important, are produced by merely mechanical causes, whilst others owe their origin to morphological processes of growth in the brain substance itself, the fissures representing lines of retarded, whilst the convolutions represent areas of increased, growth. In highly convoluted brains we may expect to find areas of growth rising from the depths of the original and primitive fissures.

Dr. Parker distinguishes only three lobes in each hemisphere, an anterior, an inferior, and a posterior, which he calls the occipito-frontal, occipito-temporal, and occipital. The parietal lobe does not represent a lobe of the hemisphere in any morphological sense comparable or homologous to the three lobes mentioned. The island of Reil, also, is not in any sense morphologically similar to the other lobes.

The temporary furrows found in the early months of foetal life are due to greater growth of the hemispheres in proportion to the growth of the skull, and the fact that the cerebral sac later becomes smooth

again proves that the skull accommodates itself to this increased growth by more rapid expansion, and, as a consequence, these plications unfold. On the outer surface they radiate toward the middle of the fossa of Sylvius, which evidently is the centre of pressure, on the mesial surface; the mathematical regularity is even more pronounced, as the resolution of forces takes place along a plane instead of upon an irregularly spheroidal surface. The triradiate fissure of the mesial surface (composed of the callosal, hippocampal, and calcarine) is made by an inrolling into the ventricles as a result of pressure. As development proceeds beyond the fourth month the brain again becomes almost entirely smooth.

The primary fissures of the primate brain are the fissure of Sylvius and the mesial arched fissure (triradiate); these are the first to appear in the development of the human brain and all other primates, and have definite relations to the hemisphere itself and to all other fissures and convolutions which appear later; they are produced by purely mechanical action taking place between the growing brain and the expanding skull. The Sylvian fissure is found in the brain of man at the end of the third month. The closing in of the island of Reil is partly due to the growing upward of the temporal lobe, but mainly to a rolling downward and backward of a fold of the frontal lobe over the floor of the fossa, and thus gradually shelving it in. In the brain of the negro the island is not as well covered in as in the white man, and approaches in this respect a more foetal character. The Sylvian fissure also has a somewhat different form in the negro brain. There is not one of all the points which have been asserted to be characteristic of the convolutions of the human as distinguished from the ape brain which the study of the negro brain will not show to be entirely relative.

In man the occipital lobe reaches its highest complexity, and is the last to develop completely. The nomenclature of the ape brain can be transferred directly to man even in describing this lobe, and positive advantage arises therefrom.

In the negro brain the calcarine fissure is continuous throughout its entire length, the development of annectant folds in the white brain in the calcarine fissure is an indication of high cerebral development, and, instead of fissuration giving rise to convolutions, we find through local morphological development the evolution of convolutions giving rise to the production of new fissures.

The brain of an adult monkey, *Hapale midas*, of a foetal monkey, *Cebus*, and the brain of man in one stage of his existence are similar as regards type of fissuration; a beautiful illustration of that firmly established principle that what is transient and embryonic in a higher form is permanently represented in a lower; and that the history of development of an organ tells us the history of its origin. The primary occipital arch (Parker), composed of the combined fissuræ *perpendiculares interna* and *externa*, or superior occipital fissure and inferior occipital fissure, cuts off distinctly the occipital lobe in the monkey's brain.

The central fissure is comparable to the posterior portion of the superior occipito-frontal fissure, and the anterior and posterior central convolutions Parker regards morphologically as displaced posterior portions of the superior and middle frontal convolutions. The central

fissure, owing to this downward development, becomes completely separated from the superior frontal.

The *fissura occipitalis transversus* represents the external perpendicular of the ape brain, which has been thrust backward and variously contorted by the increased convolitional development taking place in this region.

The *plis de passage* of the occipital lobe are nothing but the posterior extremities of the occipito-frontal and occipito-temporal convolutions, which are checked in their development by the evolution of the occipital lobe in the primates, and finally reach the surface by a renewed growth in this region.

The identification of the crucial fissure of the carnivora with the fissure of Rolando is morphologically incorrect; the former is really a vertical and lateral development of a fissure of the mesial surface.

The lobulus centralis appears to be peculiar to the primate brain. All fissures of the hemisphere may be divided into five classes:

1. Fundamental primary or typical fissures.
2. Secondary fissures: those giving special character to the type of convolitional configuration.
3. Vegetative repetitions of the secondary fissures, which increase the complexity of the cerebral surface, and may be termed sulci.
4. Sulculi: which give special characteristics to particular groups of brains and are usually repetitions of sulci, or small and apparently irregular fissures.
5. Rami: constant branches of fissures or sulci.

A brief chapter is devoted to the study of the convolutions and fissures in some of the other orders of mammalia; this is followed by a chapter devoted to a mathematical theory in regard to the formation of cerebral fissures, based on the principles deduced by Plateau from a study of the laws of formation of partitions formed by spherical liquid films, such as are made by the meeting of two or more soap bubbles.

W. G. S.

DIE ZUCKERKRANKHEIT UND IHRE BEHANDLUNG. VON PROF. DR. CARL VON NOORDEN. Zweite vermehrte und umgearbeitete Auflage. Berlin: Verlag von August Hirschwald, 1898.

DIABETES MELLITUS AND ITS TREATMENT. By Dr. CARL VON NOORDEN. Second revised and enlarged edition.

THE first edition of this work, an English translation of which appeared in a large *System*, at once became popular, and there can be no doubt that a similar reception awaits the present edition. The alterations and additions mentioned in the title occur on almost every page, but, by omitting many sentences or paragraphs the matter of which was obsolete, the volume is no larger than its predecessor. The good points of the work are all preserved. These are, especially, clearness in stating the present knowledge of diabetes and the various theories of its origin, and an equally lucid method in giving the clinical picture and explaining the diagnosis, prognosis, and treatment. If the theories are not analyzed in great detail this must be com-

mended by those who wish to use the work with reference to practical medicine. No doubt the study of 353 cases of diabetes made by von Noorden is the cause of his judicial method. His candor is shown by the frank way in which he withdraws his former view regarding the relation of aceton to food- and body-albumin, a change due to the researches of Weintraud and others, confirmed by himself. Von Noorden controverts the idea that a marked aceton reaction in the urine is an absolutely bad sign, especially when it does not disappear under a diet such as should increase weight. Large amounts of aceton often appear in the beginning of a dietetic cure. Even less certain in prognosis than the aceton reaction is the diacetic acid reaction (of Gerhardt). A positive test for this, with aceton present, should, according to the author, not deter one from carrying out strict diet. Marked reaction for aceton and diacetic acid, with oxybutyric acid, is always serious, he goes on to show, but still they do not furnish grounds for abandoning strict diet; on the contrary, they indicate the withdrawal of carbohydrate food. Since the opposite view, a very seductive one, has been spreading recently, the unexcelled opportunities of the author for basing his statements on careful experience should be borne in mind. His remarks on prognosis in the class of cases described are equally valuable. The traumatic origin of diabetes, so much more important in Germany than elsewhere, is discussed clearly, and, like most German work touching accident insurance, is not likely to prejudice the plaintiff's case. As regards treatment, that by diet and regimen is carefully described. Organotherapy in all forms receives summary condemnation. The section on drug treatment is slightly extended, as compared with the first edition, but, except opium and possibly jambul, all specific medication is discarded. Although it is admitted that opium lessens the excretion of sugar, the bad effects of that drug are forcibly stated and the harm of its routine administration is made clear. The careful use of such a work as this must be productive of much good, and it may therefore be cordially recommended to the profession.

G. D.

DIABETES MELLITUS AND ITS TREATMENT. By R. T. WILLIAMSON, M.D. (Lond.), M.R.C.P.; Medical Register, Manchester Royal Infirmary; Honorary Medical Officer, Pendleton Dispensary (Salford Royal Hospital); Assistant to the Professor of Medicine, Owens College, Manchester. Pp. xi. 417. New York: The Macmillan Company, 1898.

IN this work the author has endeavored to present a more detailed account of this disease than is generally found in text-books or systems of medicine. Notwithstanding the wealth of literature upon this subject, he has been content to study the most important, and for that reason his bibliography does not claim to be complete. Yet it is ample for the purpose of the work and bears evidence of careful selection. Upon this and upon about one hundred instances of diabetes mellitus this book is based, and the clinical and practical sides of the question have been always foremost. In the arrangement of the work he proceeds from sugar tests to physiological considerations, taking up in succession the work of experimenters who have produced glycosuria by various

methods, etiology, symptomatology, complications, diabetic coma, pathological anatomy, forms of the disease, terminations, prognosis, and, finally, treatment. Inasmuch as most of the lesions found post mortem are nearly always secondary, or due to complications, these are briefly mentioned in the chapter on the pathological anatomy, but described in detail as each complication is presented. The lesions found in the pancreas and nervous system, however, are presented in the sections devoted to the relation between diabetes and changes in the pancreas and nervous system. Of the many suggestions which this book offers but few can be mentioned. From the stand-point of the physician the fermentation test, but with the precautions noted, is very properly preferred. As for causation, he turns more especially toward the pancreas and the floor of the fourth ventricle and adjacent nervous structures, yet he is fair in believing that these are by no means the only places in which we may seek for the origin of the disease. That he has thoroughly worked over recent literature is shown by his appreciation of Pavy's latest investigations (p. 67). An addition of real value to our knowledge is found in the author's simple method of distinguishing diabetic from non-diabetic blood—the decolorization of methylene (not methyl) blue, which is to be found on p. 191 (not 171 as the cross-reference on p. 293 has it). This is of especial importance in distinguishing diabetic from other forms of coma. As for the termination of the disease, we agree that coma is the more frequent, but we doubt if it so greatly preponderates as he would have us believe (29 in 42). In our experience, death from cardiac failure comes closely to the coma percentage, even exceeding that from pulmonary (generally tuberculous) disease. Perhaps the greater latitude in diet which has been permitted may account for the latter discrepancy.

Upon the various drugs employed in treatment the author places but moderate reliance. Martineau's observations upon the combination of lithium salts and sodium arsenate have apparently escaped him, and this is also true of both the ancient and the recent work upon jambul. His strictures upon diabetic bread are none too severe (p. 348). In this connection the services of Bouchardat in the introduction of gluten as a food for diabetics is not so important as his observations upon the value of exercise, which, however, the author does not quote. The tables concerning koumiss (pp. 336 and 337) may lead to confusion unless the text is very carefully read. The appendix contains an excellent table which is useful when for diagnostic or therapeutic purposes a very strict diet is desirable.

We have read this book with profit and pleasure. The best of the literature is presented, and the conclusions deduced therefrom tempered by the author's own observations. Much satisfaction can be found in the fact that many *lacunæ* have been filled and our knowledge is becoming not only extensive but exact. As for the curability of the disease, we believe that a larger observation would show that the outlook is brighter, and that if entire relief in a given instance is not attainable the existence of the disease is by no means incompatible with a long, comfortable, and useful life. To accomplish the most each patient should be the subject for individual study, while hard-and-fast rules should be thrown aside, and toward this the author has rendered noteworthy service.

R. W. W.

CLINICAL DIAGNOSIS: The Bacteriological, Chemical, and Microscopical Evidence of Disease. By DR. RUDOLF V. JAKSCH, Professor of Special Pathology and Therapeutics, and Director of the Medical Clinic in the German University of Prague. Translated from fourth German edition, and enlarged by JAMES A. CAGNEY, M.A., M.D., Member of the Royal College of Physicians of London, etc. Third edition, with numerous illustrations (partly colored). Pp. 523. London: Charles Griffin & Co., 1897.

THE name and works of v. Jaksch are so well known to the student of clinical chemistry and microscopy that it would be carrying owls to Athens to enter again into a detailed account of the work before us. The German edition, of which this is the translation, appeared in the fall of 1896, and in a measure brought the work up to date. A number of additions have been made, and the section on helminthology is almost entirely rewritten. The new illustrations which have been substituted for the older ones in this chapter are really excellent. We are rather disappointed, however, to find that the chapter on the Blood is still rather imperfect, and we sincerely hope that this portion will receive a thorough revision in the next edition. An adequate idea of the advances which have been made in this subject during the last few years is really not given. Leucocytosis is dismissed with but little more than one page, the technique of blood examinations on the lines of Ehrlich's work is very imperfectly considered, and v. Jaksch's account of our present knowledge of the parasite of malarial fever is likewise defective.

The chapter on the Urine is unquestionably the best and the most complete, but perhaps also a little too conservatively written. Nevertheless, the student will here find practically all that is of value from the stand-point of diagnosis. There are, of course, a great many problems in this connection, concerning which a uniformity of opinion does not exist among workers in this branch, and though, as a rule, v. Jaksch presents the subject from a neutral stand-point, he is at times, perhaps, a little too authoritative in his statements. As coming from a pioneer in this subject, however, such statements nevertheless demand attention.

The chapter on the Feces is fairly complete, but it is rather disturbing, to the American reader, at least, to find the significance attaching to the presence of the *amœba coli* in the stools and the description of the parasite disposed of in a few lines. The English translator might well have enlarged on this, to us, most important subject. The excellent work of Councilman and Lafleur we have not even seen mentioned.

The identity of the *trichomonas vaginalis* and *intestinalis* has likewise been overlooked. Under the heading of the Gastric Juice we note that Töpfer's method of testing for free hydrochloric acid, as well as his quantitative method, have not been described, while some of the older and less reliable methods are still retained. It must be admitted, of course, that the advances in clinical chemistry and microscopy have been so great during the last few years that it is almost impossible to keep a work upon these subjects thoroughly abreast of the times. We must confess, nevertheless, that we had hoped for a more thorough revision at the hands of the author, as well as those of the translator.

Sixty-one pages of the book are devoted to Bibliography—a feature which renders the work most valuable to the special student of this branch. The index, as in the former editions, is excellent, and the publisher's work very well done.

C. E. S.

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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Erythromelalgia in Disease of the Spinal Cord.—Mitchell in his second paper (1878) put forward the opinion that this remarkable condition might in the future be found associated with distinct lesions in definite regions of the brain or cord. Cases have been reported in connection with locomotor ataxia and with acute disease of the spinal cord, but the most extensive collection of cases in connection with central disease has been reported by JAMES COLLIER in the *Lancet* for August 13, 1898. He has met with ten cases in the short period of six months' service at the National Hospital for the Paralyzed and Epileptic. This is a very remarkable experience when one considers that a recent writer on the disease, Rost, states that there are in the literature only some forty genuine cases. Six of Collier's cases presented the signs of disseminated sclerosis, two were cases of tabes, one a chronic myelitis, and one traumatic neurasthenia. The general symptoms as given in the cases certainly suggest the condition described by Mitchell as erythromelalgia, though in one or two the features were rather those of vasomotor paralysis. Collier lays a good deal of stress upon the value of the existence of this symptom in the diagnosis between functional and organic disease. He suggests the following explanation:

"In several of my cases there occurred at first only spontaneous attacks; afterward the conditions became frequently induced by the dependent posture, and later a condition of permanent vasomotor palsy of greater or less degree made its appearance, the attacks meanwhile continuing. This sequence suggests an irritative lesion of nerve-structures governing the bloodvessels being the cause of the vascular crisis and of the progress of this irritative lesion to a partially destructive lesion being the cause of the

persistent vasomotor palsy; these phenomena in vasomotor nerve elements being parallel with pain followed by anæsthesia in sensory nerve elements and with spasm followed by motor paralysis in motor elements. Weir Mitchell used the term 'vascular storm' in reference to this condition, and the term 'vascular crisis' would, I think, be very apt, occurring as it does in tabes associated with gastric and other sensory 'crises.' Probably the same fundamental pathological processes underlie both sensory and vascular crises. In all my cases the vascular change was never preceded by the sensory disturbance, but either preceded it or the two appeared simultaneously. It seemed as if the sensory disturbance was a local result of the altered vascular condition of the part. I would lay stress on the fact that erythromelalgia may be the first symptom of organic disease of the cord, and may be of great value in diagnosis, and especially valuable in the differential diagnosis between functional diseases and disseminated sclerosis."

The Mosquito and the Malarial Parasite.—At the recent meeting of the British Medical Association in Edinburgh, PATRICK MANSON (*British Medical Journal*, September 4, 1898) read a most interesting communication on the malarial organism and the possibility of the mosquito being the intermediate host of this parasite. He first gives a brief account of the life-history of the human plasmodium malarie. Special reference is made to that octopus-like organism commonly known as "the flagellated body," with its two to six actively moving flagella. As this organism is never seen in the freshly drawn blood specimen, and as it appears only after the blood is allowed to stand for some considerable interval, Manson believed that it served some purpose outside the human body. As it is impossible for the organism from which this flagellated body develops to escape from the human body by itself, he looked about for some agent by which this could be effected. After due deliberation, he concluded that this agency was the mosquito, being doubtless influenced by the part which he had found this parasite to play in the transmission of the *filaria sanguinis hominis*.

Manson believed that the latent parasite is sucked up by the mosquito, in the stomach of which it afterward becomes flagellated. He further thought that the flagella, after breaking off from the central sphere, by virtue of their inherent locomotive power penetrate the mosquito's stomach and enter some cell, and there start the extracorporeal life of the malarial parasite.

Whereas this was at first mere conjecture, the correctness of the theory was in part substantiated three years ago in India by Surgeon-Major Ross, who actually found the flagellated bodies in the blood contained in the mosquito's stomach after biting an infected patient. Two years later Ross actually discovered the pigmented extracorporeal parasite developing in the stomach-wall of "dappled-winged" and gray mosquitoes.

At first it seemed difficult to explain the occurrence of pigment in the parasites found in the stomach-wall when no pigment is contained in the flagella. McCollum's important observations on the halteridium, a parasite of birds, offered an explanation on this point. He observed that quite commonly free flagella fertilized a certain type of the organism in the bird's blood, the product being a very actively moving vermiculum, which was very destructive to red and white corpuscles with which it came into contact.

Manson believes it probable that an analogous process occurs in the mosquito's stomach and that a similar organism is produced which is able to penetrate the stomach-walls.

Recently Ross has made observations in Calcutta on the proteosoma, another parasite of birds. He conducted two series of experiments. He first fed gray mosquitoes on the blood of sparrows infected with the proteosoma, and always in a few days found pigmented parasites in the stomach-wall. He then fed the mosquitoes on the blood of sparrows not infected, and in every instance the examination of the mosquito was negative. In the positive cases he found the stomach-wall studded with numerous parasites which protruded into the general body cavity of the insect after six or seven days. To the organism at this stage he gave the name "proteosoma coccidium." Ross found in certain mosquitoes, particularly in those in which the protruding proteosoma coccidia had ruptured, numerous spindle-shaped bodies scattered through the body cavity and tissues of the insect. He designated these bodies "germinal rods." He afterward definitely determined that these rods were derived from ruptured organisms, and were actually the progeny of the coccidia. He believes that these rods are distributed throughout the insect by way of its blood circulation.

In dissecting the tissues of mosquitoes Ross discovered that the insect was provided with a peculiar veneno-salivary gland, one on either side of the head, and both emptying by a common duct into the proboscis. In the clear, plump cells of this gland he found enormous numbers of the proteosoma germinal rods. Ross strongly suggested that it was in this salivary secretion that the parasite left the mosquito's body. To test this point he allowed mosquitoes whose salivary glands he knew contained these germinal rods to bite sparrows in whose blood microscopic examination had shown there were no proteosoma. After some days he was gratified to find that the sparrows' blood contained innumerable parasites.

This suggestive discovery Manson thinks has a very important bearing on the part the mosquito may play in the transmission of malaria in the human subject.

PÆDIATRICS.

UNDER THE CHARGE OF

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Goitre in a New-born Infant Cured by Thyroid Treatment of the Mother.

—MOSSÉ communicated to the Académie de Médecine, April 12, 1898 (*Revue mensuelle des Maladies de l'Enfance*, June, 1898), the case of a weak, cachectic new-born infant presenting a marked bilobed goitre. The mother, herself goitrous, was in excellent health, but mentally weak. The treat-

ment of the mother consisted in the daily administration of one and one-half grammes of thyroid body. At the end of a month and a half her goitre had almost totally disappeared, and in the infant the cure was complete. A later course of treatment considerably improved the general condition of the baby.

The Pupillary Reflex in Infectious Diseases.—COSTE, of Marseilles (*Congrès français de Médecine interne*, April 12-16, 1898), has found that the pupillary reflex remains normal in measles, variola, and scarlatina; it is more or less abolished in primary hemorrhagic variola. In typhoid fever, if a pulmonary complication arise, the reflex is diminished; in infectious endocarditis it may be completely paralyzed, and in cholera its absence is of fatal significance.

The Role of Secondary Infections in the Hemorrhagic Forms of Eruptive Fevers.—HAUSHALTER and ÉTIENNE (*Revue mensuelle des Maladies de l'Enfance*, June, 1898) have found that in variola hemorrhagic complications appear to be due to a secondary infection of the streptococcus. This organism has been found in pure culture in the blood and viscera of a child dead of a hemorrhagic septicæmia appearing at the period of pustulation. The disease had been contracted in the hospital during convalescence from diphtheria. But the most important argument for this view was found in a distinct dissociation observed to exist between variola and hemorrhagic streptococcic septicæmia, as instanced in a child affected with a discrete and very benign variola, developing normally; during the convalescence fatal hemorrhagic complications occurred as the result of the removal of the patient during the first period of the disease to a ward in which hemorrhagic cases of the disease were being cared for. Moreover, the hemorrhagic form appeared to be independent of previous vaccinations. The authors conclude that in variola a mixed or secondary hemorrhagic streptococcic infection may occur.

A generalization of these conclusions with reference to other infectious diseases was offered by a case showing a hemorrhagic staphylococcic septicæmia during the desquamative stage of scarlatina.

Treatment of Infantile Syphilis by Hypodermatic Injections of Mercury.—FEDTCHENKO (*Semaine Médicale*, 1898, No. 9) has made a number of trials of the hypodermatic method of treating acquired or inherited syphilis in children, with very satisfactory results. The solution used was composed of fifteen centigrammes each of benzoate of mercury and chloride of sodium in fifteen grammes each of glycerin and distilled water. Of this two divisions of the ordinary Pravaz syringe, or one milligramme of the mercurial salt, are given to infants of one month, three divisions to those aged two or three months, four to those aged from four to six months, and five to those between seven months and one year. With children of more than one year the strength of the solution is doubled, and three to six divisions of the syringe injected, according to age. The injection is repeated every three or four days. According to Fedtchenko's observations, this treatment has always been well supported and has never provoked general disturbance, stomatitis,

or digestive trouble. At the point of injection there has been no inflammatory reaction or induration. The buttocks have been found to offer the most satisfactory region for injection, and four insertions can readily be made on each side, the solution being thrown deep into the muscles.

The therapeutic results have been most favorable. Recent macular eruptions have disappeared after three or four injections, papular and ulcerous syphilides after six or seven, and gummous lesions after nine or ten. The treatment is continued until complete disappearance of every manifestation of the disease, and is then suspended for from three to five weeks, after which six to eight injections are made. The child is then kept under observation for at least three months. Relapses have never been observed.

Changes in the Peripheral Lymph-glands in the Chronic Gastro-enteritis of Nurslings.—FRÖHLICH (*Jahrbuch f. Kinderheilkunde*, 1898, Band xlvii. S. 20) calls attention to the frequency of adenitis, especially of the inguinal glands, in chronic gastro-enteritis. These swollen glands vary in size from that of a lentil to that of a cherry; they are elastic and disposed in chains, in general resembling the adenopathy provoked by syphilis.

Histological examinations were made by the author in twenty cases in which the children during life presented no other general disease or local affection; none of the glands were tuberculous. In five cases there was simple hyperplasia; in three hypertrophy of the follicles; in one cirrhosis, with considerable increase of the interstitial connective tissue; in six multiple hemorrhagic foci; and in five a degeneration with necrosis similar to that observed in diphtheria. In no case were micro-organisms found in these ganglia.

The author attributes this adenitis to a special effect of toxins elaborated in the intestine.

A Grave Intestinal Infection of Infancy.—TOMMASI (*Journal de Clinique et Thérapeutique infantiles*, 1898, No. 18) describes a grave epidemic disease which he has observed for several years in and about Naples during the summer season. The symptoms in general present the following characteristics: The disease begins with a simple gastro-intestinal catarrh, in which uncontrollable vomiting is a marked feature. The tongue is never typhoid in appearance, and the spleen is not enlarged. Gradually the nutrition fails and the nervous system shows evidences of depression or of excitation (persistent blepharospasm, eclampsia, convulsions of Jacksonian type, mydriasis, myosis, meningism). The fever is of no distinct type; it presents rapid and transitory elevations, sometimes is wanting altogether. Various cutaneous eruptions, scarlatiniform, rubeolic, or papular in type, with petechiæ or furuncles, have been observed at all periods of the disease and with variable distribution, preferably upon the trunk. Perspiration is abundant, as is also diuresis at the beginning; but later, with the aggravation of the disease, the urine diminishes and eventually is suppressed.

As complications, angina, thrush, broncho-pneumonia, and otitis have been observed. Autopsy has shown slight alterations in the intestines, the liver slightly enlarged, the spleen and nervous system normal. The duration is variable and the prognosis is always grave. Hot weather and errors of diet appear to play the principle rôle in etiology. According to the

bacteriological researches, the author concludes that the colon bacillus is the principal agent, since it has been found constantly in the stools in large numbers. The variability of the clinical picture depends upon the association with other bacteria, among which are the bacillus subtilis, the proteus, staphylococci and streptococci.

[The author has given a very easily-recognized picture of the grave forms of milk-infection of hot weather, with which all American observers are thoroughly familiar.]

The Enanthem of German Measles.—FORCHHEIMER (*Pediatrics*, July 1, 1898), at the recent meeting of the American Pediatric Society, described as characteristic of this disease an enanthem which he has been led by observation to believe must be present in all cases. This is a macular, distinctly rose-red eruption upon the velum of the palate, the uvula, extending to but not onto the hard palate. These spots are arranged irregularly, not crescentically, are the size of large pinheads, and are very little elevated above the level of the mucous membrane. In twenty-two cases in which the eruption was studied there was no instance of the exanthem with which there was not present a suggestion of the enanthem. It is, however, very short-lived, and fades away within the first twenty-four hours, and then appear certain results of involution, not present in the majority of cases.

It is the same eruption found upon the skin, characterized by the size of efflorescence, its arrangement, the absence of great infiltration, and, above all, by its color, a pure pinky rose-red, almost exactly the same as the roseola of typhoid fever. During involution pigmented deposits are sometimes left, usually of a yellowish or yellowish-brown color, either in spots or in streaks.

The claim of distinctiveness is supported by comparison with the enanthem of the two diseases with which rubella is confounded. In scarlatina it appears from twelve to twenty-four hours before the eruption, upon the pillars of the fauces, in the form of the characteristic puncta, then rapidly spreading over the mouth in the form of a scarlet-red coalescing eruption, which finally ends in desquamation, producing the strawberry tongue, and lasting well into the second week of the disease. In measles the enanthem begins upon the soft palate from thirty-six to forty-eight hours before the exanthem, in the form of purplish or bluish papules, arranged crescentically, and extends over the cheeks, accompanied by the blue tongue. It is at its maximum with the beginning of the eruption, and may take as long as three to four days to disappear.

In conclusion, the author stated that these studies were made in one epidemic only, and their verification must rest with the study of other epidemics before they can be accepted as belonging to all cases of rubella under all circumstances.

Dr. Fruitnight had found the sign described by Dr. Forchheimer in more than 70 per cent. of the cases, and was inclined to think it a diagnostic test. In concluding the discussion Dr. Forchheimer stated that the spots in German measles did not increase in size. When they appeared they came out in their largest circumference, and then there took place a process of involution which sometimes in very pale mouths led to pigmentation, just as pigmentation may occur in the skin.

SURGERY.

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Diagnosis and Treatment of Spasmodic Stricture of the Œsophagus.

—RUSSELL (*British Medical Journal*, June 4, 1898) reports seven cases of this character that have come under his personal observation; he does not believe they are as rare as commonly supposed. This is that stricture which is situated at or near the cardiac orifice of the stomach, and is caused by muscular spasm, superimposed upon a greater or less degree of more permanent contraction.

The apparent rarity of the disease the author believes to be due, in the first place, to the misleading character of the symptoms, suggesting, as they do, disease of the stomach; and, secondly, to the inefficacy of treatment by bougies in this condition, causing a diagnosis of stricture, once made, to be abandoned or modified, since the symptoms persist after supposed dilatation. As to treatment, that which the author has used with success consists in stretching the stricture, by an expanding dilator, to a calibre approaching that of the normal œsophagus at that point. This is not done suddenly at one operation, but with bags of increasing size and at several sittings. Four cases were completely cured by this means, one was much improved, and one was not improved.

The author suggests: That in all cases of persistent vomiting, unless obviously due to disease of the stomach, it should be positively ascertained whether or not a stricture is present; and that it should not be assumed that no stricture or spasm exists because none can be detected by a bougie, nor that stricture is not the cause of the symptoms because these persist after the largest bougie has been passed. In cases of doubt the behavior of food given through a tube may be of assistance. In using instruments for the diagnosis or treatment of stricture it is very easy to be deceived on the question as to whether they have passed into the stomach or not; measurement of the length passed in is no infallible guide. In using the dilator the author always passes it well below the point required, and then withdraws it until it is in the stricture before expanding.

The Surgical Treatment of Pyloric Obstruction.—In treating of the various forms of pyloric obstruction, PAUL (*British Medical Journal*, June 4, 1898) says that of the three operations used in the treatment of fibrous strictures of the pylorus, divulsion, pyloropasty, and gastro-enterostomy, the

former is unsatisfactory and must give place to the other two. Pyloroplasty is the best operation, but, unfortunately, it is not applicable to all cases. When the parts are sufficiently yielding to permit a broad band of healthy mucous membrane to be drawn into the contracted pyloric orifice, the result is perfect—better, he thinks, than is ever obtained by any other stomach operation. When, however, it cannot be done in this manner gastro-enterostomy is distinctly the better operation. Moreover, when active ulceration is present, it is generally undesirable to operate in its immediate neighborhood. Pyloroplasty is probably a less severe operation than gastro-enterostomy, but this need be considered only in exhausted subjects, when pyloroplasty should be done, if possible.

For malignant stricture there are only two operations, pylorotomy and gastro-enterostomy, unless some pyloroplasties for obstruction, where only part of the pylorus was involved, should prove to be successful.

Pylorotomy should be reserved for favorable cases. A gastro-enterostomy is the most that a person in an exhausted condition can be expected to survive. In other cases the extension of the growth places a limitation on the form of operation. Attempts at total excision of the stomach should be very few, and pylorotomy should only be attempted when the growth is very small, and, above all things, freely movable. The preferable form of operation is to unite the cut ends, but where this is impossible they should be closed and a gastro-enterostomy performed. The author has some doubt regarding the choice between simple suture and suture combined with a button or bobbin; he inclines toward the former, when approximation is easy. When there is any difficulty in applying the sutures the posterior ones are in danger of proving insecure, and here the button is an advantage.

Of gastro-enterostomy, the author says its greatest failing has always been a high mortality, due, no doubt, to the exhausted condition of the patient at the time of operation. As a matter of fact, mechanical appliances and simple suture are both very well in their way, and succeed in the right sort of patients, but are not suitable for exhausted subjects. The dangers are increased by their low vitality, and the mechanical support becomes a source of danger. As a foreign body, it lies in contact with the wound, and, in case of the button, about the sixth or seventh day perforation is liable to occur, with extravasation of the gastric and intestinal contents into the peritoneal cavity, and rapid collapse and death. Plain suture has difficulties and dangers quite as great. The time occupied in effecting a water-tight union, the greater danger of contaminating the peritoneum during the operation, and the subsequent tendency which the opening shows to close are substantial objections to this mode of operating. At present the choice lies between rapidity and primary security of the button and the slowness and less perfect primary security of the suture operations. They are neither operations for exhausted subjects. The author proposes the following operation, trusting it may suggest some better if it is not perfect in itself.

“The bowel and stomach having been exposed, a longitudinal incision is made in the former for two inches in the human subject, through the peritoneal and muscular coats only. These are reflected with a small, curved, blunt dissector over an oval area having a diameter of one inch in the centre. The exposed submucosa is then rubbed with a stick of zinc chloride,

say half a dozen times, being well dried between each application, when it assumes a gray, dead look. The bowel is now wrapped in a piece of moist absorbent wool and laid on one side, while the stomach is dealt with in an almost similar way. In preparing the stomach for the anastomosis, instead of making a linear incision, an oval patch of musculo-peritoneal coat is excised; the muscular coat being so much thicker in this organ, it is rather in the way if only reflected, and, what is of more importance, the loss of substance helps to prevent subsequent contraction of the opening. Both of the wounds having been duly cauterized, they are brought together, and a continuous suture of the finest green gut or silk is run around the edges, not, of course, penetrating the mucous membrane, but picking up as far as possible the tough submucous coat. Finally, a few Lembert sutures or Halsted sutures are generally desirable, especially in anterior gastro-enterostomy.

The operation has been successful in dogs, a sloughing taking place in forty-eight hours and establishing the anastomosis after good firm union has taken place.

The features of the operation that the author hopes may be reckoned advantages are:

1. The effect is one of pure traumatism. The viscera not being opened, all risk from such sources is avoided.
2. No foreign body is used.
3. The time occupied is less than for a suture operation though more than for Murphy's.
4. The anastomosis resulting from loss of tissue should be more durable than in the majority of methods.

The complete absence of shock in the experimental cases was a noticeable feature as compared with other cases done by other methods. There was much less pain.

The author also briefly reports a series of twenty cases of operation for pyloric obstruction.

The Action of Sympathicotomy on the Exophthalmia and Tachycardia in a Case of Exophthalmic Goitre.—COMBERMALE and GAUDIER (*Gaz. Hebdom. de Méd. et de Chir.*, April 24, 1898) report an interesting case in which Jaboulay's operation produced the following results. The patient was a female in whom, for some unknown reason, a goitre began rapidly to increase in size and was accompanied by exophthalmia, tachycardia, and all the symptoms of hyperthyroidization. No medicine appeared to have any effect; the heart could not be calmed, and its increasing action threatened the life of the patient. Recourse was had to section of the cervical sympathetic. The results were: 1. An immediate diminution in the exophthalmia. 2. A decrease of the pulse during a week from 200 to 100 per minute, and at the same time the disappearance of præcordial pain. 3. Absence of any modification in the goitre itself.

The cessation of palpitation, the lessened dyspnoea and disappearance of angina caused sufficient relief to make the patient satisfied with the operation, while the disappearance of the tachycardia and of the other dangerously threatening symptoms recompensed the operators.

The sudden drop in the pulse the authors would ascribe not to any direct

action or to action through the contiguity of these nerves to nerves about the heart; it was delayed in appearing, and did not take place immediately. They agree with Werthimer in believing that the thyroid fibres of the sympathetics after the section of the main trunk cease presiding over the activity of the thyroid secretion which causes the tachycardia, and that the rapid action of the heart ceases because the cause is thus stopped.

The fact that the goitre did not decrease in size would tend to show that the operation had no effect on the colloid matter excreted. In the normal state both vary in the amount physiologically secreted. We see small goitres that produce hyperthyroidization, and it is perfectly admissible to suppose that the section of the sympathetic may prevent the secretion of the toxin without interfering with the secretion of colloid material.

If this is true, the section of the sympathetics in cases where exophthalmia and tachycardia are the menacing symptoms is the operation of choice.

THERAPEUTICS.

UNDER THE CHARGE OF

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Urtica Dioica.—M. HJALMAR AGNÉR, under the title of “Forgotten or Neglected Medicinal Plants,” recommends this as depurative, diuretic, and a galactagogue. An infusion made from the roots and stems, freshly collected in spring, is an excellent remedy for the anæmia so often met with in early spring.—*Bulletin Général de Thérapeutique*, 1898, 21e liv., p. 801.

[The stinging nettle has been chiefly used as an astringent in uterine hemorrhage.—R. W. W.]

The Treatment of Chlorosis by Hot Baths.—DR. ROSIN, failing with regulation diet and the administration of drugs, as iron and arsenic, has made use of baths, of fifteen minutes' duration, at a temperature of 89.6° F., thrice weekly. Each bath is followed by a short cold affusion. Cure was obtained in four weeks in more than fifty instances which had been under observation.—*Klinisch Therapeutische Wochenschrift*, 1898, No. 17, S. 575.

The Treatment of Gastric Ulcer.—M. FRÉMONT regards gastric hyperacidity as the principal causative factor. The first indication is to relieve the gastric juice of its digestive activity. For this two methods, which are readily combined, present themselves: Milk fixes the hydrochloric acid; the alkalis neutralize it. The neutralized juice does not digest. The second indication is to cover the surface of the ulcer so as to prevent contact with the gastric juice. To neutralize a fluid which is constantly being secreted, frequent doses are necessary. For instance, two or three tablespoonfuls of warm (100.4° F.) milk are given every thirty minutes for twenty

consecutive hours, to which a grain of calcined magnesia, a grain of prepared chalk, two grains of bismuth subnitrate, and four grains of sodium bicarbonate are added. During the remaining four hours of the night this dose is given every hour. The amount may even be increased if the pain is not relieved. If there is repeated hemorrhage, ice should not be given internally, but an ice-bag upon the stomach is beneficial.—*Bulletin Général de Thérapeutique*, 1898, 23e liv., p. 909.

The Action of Sodium Chlorate upon Hyperchlorhydria.—M. SOUPAULT prescribes this drug in the daily amount of two drachms, in from two to four doses, as far as possible from meal-times. The results have been remarkable with all patients suffering from hyperchlorhydria, whether or not complicated by ulcer. In the paroxysmal crises relief is rapidly obtained; the remedy clearly diminishes the gastric secretion without modifying its quality. The drug should not be given if there is reason to suspect any renal disease.—*Revue de Thérapeutique Médico-Chirurgicale*, 1898, No. 13, p. 445.

Thallium Acetate as a Remedy for the Nocturnal Sweating of Phthisis.—DR. H. HUCHARD, in commenting upon a paper presented by Combemale before the Paris Academy of Medicine, calls attention to the disadvantages of this drug. Given as a pill in dose of one and one-half grains—in one instance in double this quantity—it was efficacious, when administered one hour before the expected sweating, in all periods of the disease. Often a single dose sufficed; rarely was it necessary to continue it for more than seven days. If it did not produce the desired effect within four days, it was useless to continue it. Although this remedy possesses toxic properties, these were not encountered during the ingestion of therapeutic doses. The contraindication to this drug is the alopecia which it produces, so marked in one instance that total baldness followed the administration of a dozen pills. The question is raised as to its effect locally applied, and whether it does not enter into the composition of depilatory pastes.—*Les Nouveaux Remèdes*, 1898, No. 12, p. 265.

The Treatment of Hepatitis.—MR. JAMES CANTLIE states that the first essential is rest, and the object of this is to prevent the diaphragm moving over the top of the liver. The patient must be placed in the horizontal position. To fix the lower part of the chest, strapping is an excellent means. Hot fomentations, or a very large poultice changed every three hours, are useful. Local application of nitro-hydrochloric acid is a favorite remedy; it is thought that baths of this do not possess any specific virtue. As for food, milk is admissible only in the form of whey; starchy foods must be withheld, while animal food in its most digestible form is the keynote of successful dieting. Only enough to support life ought to be given, so long as acute symptoms remain. Raw-meat juice, raw meat itself, chicken-soup, and weak beef-tea should form the elements of diet. As drinks, hot water and weak, freshly-made tea with lemon are the best. As the acute symptoms subside, the "meat" nourishment may be increased, and the first starchy food to be administered ought to be well-steamed rice. To clean out

the bowels calomel is the best drug to use ; three grains given on an empty stomach is the best form. If the bowels are not freely moved after twelve hours have passed, sodium sulphate, the effervescing salt, a half ounce in a small quantity of water, is recommended. Acids and alkalies should be avoided. Ammonium chloride in twenty-grain doses, either alone or in combination with potassium iodide and bromide, may be made into a mixture in conjunction with taraxacum. When pus is suspected, aspirate, tap, and drain. The danger to the lung or diaphragm from tapping should not be considered.—*The Clinical Journal*, 1898, No. 295, p. 161.

Enteric Fever in India.—DR. RICHARD H. QUILL considers the treatment of this disease on the antiseptic principle. He has treated forty-six patients, of whom two died. This mortality (4.3 per cent.), as compared with the usual average in India, which is seldom below 20 per cent., is gratifying. For the treatment no more milk—and even that, if necessary, is peptonized—is given than can easily be assimilated. All milk is to be boiled, and to each pint is added one ounce of an alkaline mixture consisting of sodium bicarbonate, 4 ; sodium chloride, 1 ; in water, 96. Nourishment (this and beef-tea or chicken-broth) is given at regular intervals, immediately followed by the antiseptic mixture. If there is distention of the abdomen or blood in the stools, an ice-poultice suspended in a tray which is attached to a surgical cradle is kept constantly in apposition to the abdomen. If the patient comes under observation during the first week, two grains of calomel at night, with one the next morning, are given on the first day. The antiseptic employed is : Pure carbolic acid, 1 ; compound tincture of chloroform, 4 ; compound tincture of cardamom, 4 ; syrup of orange, 16 ; chloroform water to 192. Of this one ounce, with an equal quantity of iced water, is taken every second or third hour, immediately after food—that is, from five to ten doses each day, according to the severity of the disease. After the temperature has fallen to normal, from three to five doses should be given each day for at least a week in order to prevent relapses. In no instance were unpleasant effects noticed. A second prescription, which has been found equally useful when its flavor has not been objectionable, is : Oil of eucalyptus, 1 ; mucilage of acacia, 8 ; aromatic spirit of ammonia, 4 ; glycerin, 2 ; spirit of chloroform, 2 ; chloroform water, 96. Of this an ounce is to be administered every third or fourth hour. The effects observed, and which are ascribed to the treatment pursued, are as follows : (1) Intellectual clearness of the patient, with very slight tendency to delirium or stupor. (2) Food invariably well assimilated. (3) Abdominal distention, except to a very moderate extent, invariably absent. (4) Early cleaning and moistening of the tongue ; dryness very rarely present. (5) Stools almost completely deodorized. (6) An offensive odor from the breath or body of the patient rarely observed. (7) Tendency to undue looseness of the bowels rarely present. (8) Secondary complication of any kind never noticed. (9) The fever pursued its course “ kindly,” with little distress to the patient. (10) Convalescence rapid and complete. The author was unable to satisfy himself that : (1) The duration of the fever was lessened. (2) There was any marked and continuous lowering of the thermometric range, or (3) that an occasional tendency to relapse was removed.—*British Medical Journal*, 1898, No. 1950, p. 1254.

GYNECOLOGY.

UNDER THE CHARGE OF

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Vaginal Hysterectomy without Forceps or Ligatures.—TUFFIER (*Revue de Gynécologie et de Chirurgie Abdom.*, 1893, No. 4) reports twenty-seven cases of vaginal hysterectomy operated upon by the following method: The uterus is first freed from adhesions, is bisected in the usual manner, and one-half is drawn out of the vulva. The finger is passed behind the upper part of the broad ligament and the included tissue is grasped between the jaws of a powerful clamp, called the *angiotribe*, which is tightly screwed. The tissues are thus destroyed and the ovarian artery occluded. The lower portion of the ligament is then seized with the instrument, guarded by the finger as before, and the included tissues with the uterine artery are similarly compressed. The same procedure is carried out on the opposite side. The uterus is thus detached and can easily be removed without fear of hemorrhage. In short, the same technique is employed as in an ordinary clamp-operation, except that the clamps are not left in position. In complicated cases, in which morcellation of the uterus is necessary, the broad ligaments are first secured with clamps, which are removed in time from below upward after the included tissues have been caught and crushed with the angiotribe. Two cautions are added in using the instrument—to screw the handles as tightly as possible and to keep the blades in the axis of the vagina, so as not to tear the tissues outside of their grasp. In none of the reported cases did any accident occur during the operation, the absence of hemorrhage being especially noted. The author believes that this method is applicable to any case in which vaginal hysterectomy is indicated.

Chelidonium Majus in Inoperable Carcinoma of the Uterus.—FREUDENBERG (*Centralblatt für Gynäkologie*, 1897, No. 30) reports the results of experiments in Landau's clinic. He used tampons saturated with a 50 per cent. solution of the extract every day or every second day. The applications were painless and caused no general disturbance. The growth of the disease toward the vaginal roof was arrested, the foul discharge was lessened or ceased, and, in a few instances, the hemorrhages were checked. While in no sense a curative, the remedy seemed to have a decided palliative effect.

WINTER and SCHMITT (*Ibid.*) report fourteen cases of inoperable carcinoma treated with chelidonium. About twenty minims of the aqueous extract were injected subcutaneously in three or four places in the abdominal wall; it was also administered internally in daily doses of from twenty to sixty minims. The injections were very painful. It seemed to improve the digestion, but had no influence whatever upon the progress of the disease.

Menorrhagia at the Menopause.—ORLOFF (*Wratsh; La Gynécologie*, 1898, No. 2) employs intra-uterine injections of equal parts of a solution of

alumnol in alcohol and tincture of iodine (each 50 per cent.), after previous thorough disinfection of the vagina. The result of this treatment in every instance was to arrest or diminish the hemorrhage, menstruation afterward recurring normally. The results are less marked in cases of fibroids, although the bleeding is certainly checked. The injections are usually repeated at intervals of two or three days, the patient being kept in bed for at least two hours afterward.

Administration of Ovarian Extract.—JAYLE (*Revue de Gynécologie et de Chirurgie*, 1898, No. 4) concludes a supplementary paper on this subject as follows: Ovarian opotherapy is really the practical application of the general theory advanced by Brown-Séquard with regard to the internal secretion of the ovary. It has now met with such success in the hands of various experimenters as to warrant the belief that the cases in which beneficial results have followed are not mere coincidences. Ovarian extract certainly acts directly for the relief of the disturbances attending the climacteric, both the natural and the artificial. It is also indicated in amenorrhœa, dysmenorrhœa, and anæmia of ovarian origin. The writer has also noted good results in the treatment of some cases of oöphoritis. As a result of the careful study of this subject, gynecologists have been led to recognize the important relation of the ovarian function to the general health, and hence have become more generally conservative in their operations upon the adnexa.

Importance of the Omentum in Abdominal Operations.—CORNIL and CARNOT (*Bull. de l'Acad. de Méd.; La Gynécologie*, 1898, No. 2) describe a series of interesting experiments on dogs, from which they draw certain practical inferences with regard to the protective action of the omentum. It is not necessary to draw it down over a raw surface, since its natural tendency is to seek such a surface and to become adherent to it. In the same way it attaches itself to an inflamed organ within the pelvis and serves to wall off purulent foci from the general cavity. In tubercular peritonitis it becomes attached to the abdominal wall and acts as a diaphragm, shutting off a collection of purulent fluid below from healthy tissue above.

Pseudomembrane in Vesico-vaginal Fistula.—LIONVINOFF (*Journ. d'Obstet. et de Gyn.*, 1898, No. 2) has examined bacteriologically the so-called diphtheritic membrane which forms around the edges of vesico-vaginal fistulæ. In every instance he found the *bacterium ureæ* of Leube, as well as small, rod-shaped organisms with rounded ends, which liquefied gelatin and gave a green color in agar. The latter were evidently the *bacillus pyocyaneus*. He infers that these may not only develop in a suppurating wound, but, by penetrating more deeply, may give rise to obstinate local infection.

Necrosis of the Vagina.—BARSONKOFF (*Soc. d'Obst. et de Gyn.; La Gynécologie*, 1898, No. 3) reports a case of sulphuric-acid poisoning in which, eight days after her entrance into the hospital, the patient had a slight vaginal hemorrhage. A few days later, without having had any elevation of temperature, she passed a large slough representing a complete cast of the

vagina. This included the entire thickness of the vaginal wall and some of the subjacent connective tissues. No cause could be discovered, the patient firmly denying that anything had been introduced into the vagina. The writer cites three similar cases of sloughing of the vagina occurring during the fourth week of typhoid, when the temperature was declining. In these cases, as well as in the one reported, in spite of the extensive loss of tissue, no marked contraction of the canal was noted.

Pathological Anatomy of the Fallopian Tubes.—LINGUEN (*Journ. d'Obstétrique et de Gynécologie*, 1898, No. 2) concludes, from examinations of a number of diseased tubes, that the tube is not simultaneously infected throughout its entire length, but that the infection begins at the abdominal end. Each tube may be the seat of a different infection at the same time; thus, a simple catarrhal salpingitis may exist on one side and a pyosalpinx on the other, no difference in the secretion being revealed by the microscope. While gonorrhœa and puerperal infection are the most frequent cause of salpingitis, it is not always easy to find the characteristic micro-organisms, probably because the latter often succumb to their own toxins, so that the pus becomes sterile.

Painful Intraperitoneal Adhesions.—NOVÉ-JOSSER and GOINARD (*Journ. de Mèl. et de Chir.*, April 25, 1898) describe, under this head, slight adhesions resulting from localized peritonitis following lesions of the alimentary canal or accompanying affections of the female pelvic organs. They may give rise to no symptoms whatever, but usually some neighboring organ is more or less affected. Pain is most often present, persistent, well localized, and increased on deep pressure, but it is not colicky in character. At other times the pain may be dull, with occasional paroxysms, suggesting hepatic or renal colic. The paroxysms may coincide with the periods of physiological activity of the abdominal viscera. Constipation is more or less marked if the intestines are adherent, due not so much to occlusion of the gut as to exaggerated peristalsis.

Certain obscure vesical troubles are doubtless due to adhesions of the bladder.

The diagnosis is exceedingly difficult, often impossible without resort to an explorative incision, but the presence of adhesions may be suspected in the presence of persistent localized pains following an attack of peritonitis or a celiotomy. It is important to exclude hysteria, especially if operative interference is contemplated.

Operations on Fibroids After the Menopause.—PICQUÉ (*La Gynécologie*, April 15, 1898) emphasizes the fact that there is an erroneous idea that the pathological history of fibroids terminates with the establishment of the climacteric. On the contrary, it may only begin at that time. He cites three illustrative cases in which it was necessary to perform hysterectomy in women after the menopause, once for intestinal obstruction, and twice for acute inflammatory attacks ending in pelvic suppuration. In one of the latter, the condition was rendered much worse by the use of electricity.

It is important, he adds, that a fibroid should be kept under observation throughout the patient's life, since, even if the tumor itself does not give rise to trouble, complications on the side of the adnexa are to be apprehended.

OBSTETRICS.

UNDER THE CHARGE OF

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Œdema of the Placenta and Fœtal Leucæmia.—In the *Monatschrift für Geburtshülfe und Gynäkologie*, Band viii., Heft 3, SIEFART reports an interesting case in which a mother suffered from nephritis of pregnancy, albumin and casts being found in her urine. Her blood showed the red corpuscles to be clear in appearance, with increase in the white. The amount of urine was scanty.

The patient came into labor while preparations were being made for its artificial induction. Her child was born spontaneously. Under appropriate treatment, the mother made a good recovery.

The child, from birth, showed well-marked œdema of the face and head, the eyes and nose being practically closed. The abdomen was greatly swollen and also the lower extremities. The amount of amniotic liquid was small. The child made feeble efforts to breathe, but did not live. On section the skin and the tissues beneath were full of serum, and the cavities of the body contained serum in abundance. The glandular organs were swollen and the glottis was also œdematous.

On examining the placenta it was found in three different portions. It was pale red, very fragile, the placenta and membranes being œdematous.

On microscopic examination, the villi were much increased in size and the spaces between the villi were very much diminished. These spaces contained no blood, while the connective tissue was much increased. Thrombosis had occurred in some of the vessels. The placenta did not resemble those usually found in cases of nephritis. The blood of the fœtus showed great increase in the number of white cells.

The whole clinical picture is that of the kidney of pregnancy in the mother, with œdema and extensive alteration in the placenta and blood of the child.

Two Interesting Cases of Ectopic Pregnancy.—In the *Monatschrift für Geburtshülfe und Gynäkologie*, Band viii., Heft 3, VOIGT reports an interesting case of ectopic pregnancy in which operation was undertaken to relieve an increasing hæmatoma. The patient perished of shock from continued

hemorrhage after the operation. A careful examination of the specimens and of the body of the mother showed that pregnancy had taken place in the fimbriated portion of the ovary and tube. This is an unusual occurrence, and its possibility is denied by some.

In the same journal and in the same issue SEREJNIKOFF reports a case of pregnancy in the rudimentary horn of a double uterus, in which abdominal section was performed in the hope of saving mother and child. The fœtus and appendages were removed and were found to have been contained in the rudimentary horn of a double uterus. The fœtal sac was packed with gauze and drained through the vagina. The peritoneum was stitched together above the gauze. The child unfortunately survived but a short time, and the mother made a tedious recovery, complicated by fever and by prolonged discharge through the vagina.

A Case of Extensive Tear of the Uterus and Vagina Occurring in Labor and Followed by Recovery.—VAN DER HOEVEN (*Monatschrift für Geburtshülfe und Gynäkologie*, Band viii., Heft 8) reports the case of a patient in tedious labor, during which the midwife in attendance thought she observed a change from a vertex to a shoulder presentation. Some time after version was done without anæsthesia, and the child delivered as far as the head.

When the reporter saw the case he found it comparatively easy to complete the delivery. On examination there was observed an extensive separation of the vagina from the uterus, the placenta and cord having escaped through the rent. The hand could be passed beneath the peritoneum and beneath the abdominal cavity. The placenta was found high in the abdomen near the liver. The appendages were removed, clots also being extracted, and the birth-canal tamponed with iodoform gauze. The patient made a good recovery.

Forty Cases of Puerperal Fever, with Bacteriological Examination of the Uterine Contents.—In the *American Journal of Obstetrics*, September, 1898, WILLIAMS gives the results which he has obtained from the study of forty cases of puerperal fever. He has adopted the rule of making cultures from the uterine cavity if the temperature of a hospital patient reaches 101° F., and in out-patient practice 102° F. Of these cases, twenty-two were delivered in the obstetric wards of the Johns Hopkins Hospital; eight in the out-patient department of the hospital, and ten cases were seen in consultation. Thirty of these cases were delivered by persons connected with the hospital, and the remainder by those who are not so connected.

His results were as follows: Streptococci found in eight cases; staphylococci in three cases; colon bacilli in six cases; gonococci in two cases; anærobic bacteria in four cases; unidentified ærobic bacteria in three cases; bacteria on cover-glass, but cultures sterile, in four cases; diphtheria bacilli in one case; gas bacilli (*Bacillus aerogenes capsulatus*) in one case; typhoid bacilli in one case; cover-glass cultures and blood sterile in eleven cases; cover-glass and cultures sterile, with malarial plasmodia in blood, in one case, making a total of forty-four cases.

Eleven of these cases were probably sapræmic. In one case there was found in the vaginal secretion before labor an organism apparently identical with that found in the uterus after labor. This offers very slight evidence in support of the doctrine of auto-infection. In a case of abortion which was not examined internally, the temperature rose to 103.5° F. on the eighth day, and fell after brisk purgation. In this case a non-pathogenic bacillus was found resembling that of the colon. In some cases intestinal auto-intoxication was probably the cause of the fever, and the germs found had nothing to do with it.

He calls especial attention to the value of bacteriological examination in eleven cases in which no pathogenic germs could be found in the uterus. Other causes were present which accounted for the fever. It is especially valuable to be able to exclude dangerous causes in the presence of puerperal fever. In a case of quartan malarial infection also a positive diagnosis was made by this method.

Milk Fever.—HEIDEMANN (*Monatschrift für Geburtshülfe und Gynäkologie*, Band viii., Heft 3), from his studies of milk fever, believes that it is distinctly the result of infection which usually has origin in the genital tract. He believes that the poison enters the circulation from the uterus, that it paralyzes the vasomotor nerves, and that the blood-supply of the breasts is so constituted that swelling of the breasts follows this paralysis. He calls attention to the fact that in other puerperal infections the breasts are often swollen, and notes the fact that the breasts are not usually red and that evidence of local inflammation in the skin is entirely absent. On the contrary, the symptoms of septic infection are strikingly present.

Acute Inversion of the Uterus.—In the *American Journal of Obstetrics*, August, 1898, STONE reports the case of a primipara, delicate, extremely nervous and apprehensive. Spontaneous delivery proceeded until the head reached the pelvic floor. Forceps was then applied under chloroform, and a good-sized child easily delivered. The cord was wound once about its neck. The perineum was torn and a gush of blood followed delivery, but immediately stopped. While preparing to suture the perineum, it was noticed that the patient had become pale and that the pulse became frequent. Bleeding had returned. An attempt was made to express the placenta, but the uterus could not be found through the abdominal wall. The placenta was found in the vagina, adherent to the inverted uterus, from which it was removed with considerable difficulty. The cord was of average length. The hemorrhage ceased and did not return.

The patient complained bitterly of pain and went into profound shock. Two efforts to replace the womb failed, and in half an hour the patient died.

In this case it is interesting to note the nervous condition of the patient, the complete absence of pain during the greater part of the stage of dilatation, the uterine inertia in the latter part of the second stage, difficulty in the removal of the cord from the neck of the child, and the adherent placenta. All these seem to have been factors in producing the inversion. The writer adds a table of twenty-four cases showing six deaths.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF
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Lipoma of the Throat.—DR. VOLKER reports a case from Czerny's clinic (*Beiträge zur klin. Chirurgie*, 1898, Band xxi., Heft 1; *Münch. med. Woch.*, 1898, No. 23) in which a large superficial lipoma, the size of a child's head, occurred in a girl, aged fourteen years, and extended along the entire lateral region of the throat under the sternocleido muscle and the anterior course of the carotid artery. It was composed of several larger or smaller masses adherent by an osseous pedicle to the fifth cervical vertebra. Closer examination revealed this osseous pedicle to be a rudimentary cervical rib about the extremity of which the lipoma had become developed.

Extirpation of the Thyroid Gland.—I. MESSRS. EUGENE BRIAU and SARGNON report (*Gaz. Hebdom. de Méd. et de Chirurgie*, 1898, No. 52) an operation performed by Prof. Poncet, who removed an enormous cystic goitre of twenty-three years' duration from a male cretin, thirty-three years of age, and in whom, despite the intentional retention of some of the original thyroid substance, generalized myxœdema resulted.

This case was completely cured by the prolonged methodic use for three and one-half months of the thyroid preparation known as Baumann's iodothyryne—thirty centigrammes being given per day.

During the treatment M. Poncet introduced under the skin of the neck of the patient three small cubes of thyroid substance which he had just removed from a young girl, aged eighteen years. These masses were not well tolerated, the temperature becoming elevated and the wound in the neck becoming red and painful, so that it was necessary to withdraw the sutures and remove the necrosed masses. The thyroid treatment was then resumed uninterruptedly.

II. MR. COLIN GRAY read at the Bendigo Branch of the Medical Society of Victoria (*Intercolonial Medical Journal of Australasia*, 1898, No. 5) some notes on a case of exophthalmic goitre in which he removed half of the thyroid gland from a female servant, aged thirty-one years. After the enucleation a careful search was made for the recurrent laryngeal nerve, and it was found that, with the exception of a piece about the thickness of a horse-hair, the nerve had been torn across while dissecting out the gland. Some trouble was taken to find the two ends, the lower of which was eventually found in a ligature with a vein, and they were sutured with a finest Hagedorn needle and catgut.

With the exception of a little temporary hoarseness of about a week's duration, there was no evidence of injury to the voice. It is this phonic feature in the case that constitutes the chief point of interest.

Resection of the Trachea for Primary Tracheal Carcinoma.—DR. P. VON BRUNS reports (*Beiträge zur klin. Chirurgie*, 1898, Band xxi., Heft 1; *Münch. med. Woch.*, 1898, No. 23) a case of tracheal carcinoma in a man, aged thirty-one years, who had suffered for ten years with gradually increasing difficulty in breathing. The growth was attributed to cancerous transformation of an intratracheal struma. The operative procedure consisted in the resection of the posterior and left wall of the trachea for a distance comprising ten tracheal rings. The patient's life was thus prolonged for six years.

Urticaria of the Throat.—DR. M. B. LEDERMAN reports (*The Laryngoscope*, September, 1898) a case of urticaria involving the soft palate and causing alarming symptoms, in which no involvement of the larynx could be noticed, the soft palate and uvula being so œdematous as almost to close the faucial space. Large wheals were present over the chest, abdomen, legs, and arms.

The patient, a man, aged thirty-eight years, had felt a jelly-fish strike against him while bathing in the ocean, and it is thought probable that this was the exciting factor in his attack.

On Injuries to the Turbinated Bodies by Forcible Insertion of Rigid Tubes in the Nasal Passages.—In a paper on "Injury to Inferior and Middle Turbinals in Operation for Deviated Septum," read by DR. J. M. STUCKY, of Lexington, before the American Rhinological, Laryngological, and Otological Society (*The Laryngoscope*, September, 1898), two cases are reported of injury to these bodies following what is known as the Asch operation.

In one case, in which the tube had been worn for five weeks, examination six months after the operation showed the interior turbinate to be fractured and bound down by adhesions to the floor of the cavity, completely obliterating the meatus, while the middle turbinate was tilted upward until it pressed against the septum, and, besides this, it was undergoing polypoid degeneration.

In the second case, seen two weeks after the operation, the inferior turbinate was bent, but not fractured, and was adherent to the floor of the cavity, while the middle turbinate was fractured and freely movable with the probe.

These conditions were attributed by the writer of the paper to injury by the tubes, which he thinks were too short, too wide, and too large at the external opening.

[In many instances the tube is not required at all. A thin sheet of flexible metal, bent U-shaped, and inserted so as to grasp the septum between the blades, will act as a splint and comfortably keep the refractured septum in its new position, as there is no muscular movement to disturb it, thus leaving both passages free for respiration without impediment from a foreign body pressing upon the turbinates. This is practically the method adopted by Dr. Asch in his earliest operations.]

Sarcoma of the Nasal Septum.—DR. J. PAYSON CLARK, of Boston, reports (*Annals of Otology, Rhinology, and Laryngology*, May, 1898) two cases :

I. A man, aged thirty-five years, was first operated upon in 1890, for round-celled sarcoma of the nasal septum, filling the left nostril. This was removed by cold-wire snare in several sittings. Recurrence took place from time to time, and in January, 1892, the whole septum was removed and found to be completely converted into an osteoid sarcoma. The disease was found too extensive for thorough removal. When last seen the patient was evidently dying from extension of the growth into the brain.

II. A married lady, aged forty-two years, had removed from her left nostril in June, 1897, a reddish-gray tumor of at least two years' duration, and which was found to be a myxosarcoma. There had been no evidence of recurrence nearly a year after the operation.

Adenosarcoma of the Nose.—DR. MAX THORNER, of Cincinnati, reports (*Annals of Otolaryngology, Rhinology, and Laryngology*, May, 1898) a case in a farmer, aged forty-seven years, from whose nasal passage masses were removed from time to time during a period of some eighteen months. At one time the histological investigation revealed typical adenoma, which was reported by the microscopist of the hospital as malignant adenoma. Six months later, after eight or ten more operations, under other hands, the examinations in another pathological laboratory elicited the report that it was a typical case of adenoma changing into an epithelioma. The patient rapidly grew worse, and died six weeks later, the growth having broken through the wall of the nose and destroyed the left eye in its ravages.

Nasal Fibroma.—DR. E. CASSELBERRY, of Cincinnati, reports (*Annals of Otolaryngology, Rhinology, and Laryngology*, May, 1898) a case operated upon in 1886, in a lady aged thirty-nine years, who has remained free from recurrence for eleven years, without any nasal disease or discomfort whatsoever.

Rhino-pharyngeal Fibroma.—DR. HANAU W. LOEB, of St. Louis, reports (*Annals of Otolaryngology, Rhinology, and Laryngology*, May, 1898) a case of rhino-pharyngeal fibroma, with projections extending to both anterior nares (cystadenoma fibromatosum vasculosum), operated upon by him in 1892. The patient, a female subject, aged thirteen years, has had no recurrence, the nasal respiration being entirely free and unobstructed at the last examination in December, 1897.

Epithelioma of the Tonsil.—DR. A. F. JONAS, of Omaha, reports (*Journal of the American Medical Association*, 1898, vol. xxxi., No. 7) two successful cases of the removal of an epitheliomatous tonsil by external access. Both were in male subjects. One was last seen nearly four years after the operation, with no traces of recurrence. The second, which was a much more complicated case, improved for three months, when he succumbed to a catarrhal pneumonia, but without any recurrence of the disease in his throat. He had lost power of swallowing solids after the operation, and the tongue had become atrophied upon the same side of the body from which the tonsil was removed, articulation having become somewhat interfered with.

The operative procedures were similar to those practised by Cheever, of Boston, and prophylactic tracheotomy was not found necessary in either instance.

The Tonsils as Places of Entrance for Severe General Infections.—DR. F. JESSEN, Senior Physician in the Vereins Hospital of Hamburg, contributes to the *Münch. med. Woch.*, 1898, No. 23, an article in which he sums up some of the literature, and reports a number of cases showing that tonsils are the places of entrance of infection in many instances attributed to different origin, some of them even without any manifestation of disease upon the surface of the tonsils.

He likewise contends that many and varied cases of so-called scrofula are generally infectious from some portion of the lymphoid ring crossing the roof of the pharynx, and often promptly cured by removal of the diseased tissue.

OTOLOGY.

UNDER THE CHARGE OF

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Acute Mastoiditis.—Extra- and intramastoiditis, three months after measles in a child aged six years, attended with œdema of the face and side of the head, extending to the thin bony plate of the middle fossa, entirely relieved by a mastoid operation by Dr. B. M. Baker, is reported by J. F. WOODWARD (*New York Medical Journal*, October 9, 1897). [The suggestion to ward off acute mastoiditis in acute otitis media, by syringing sterilized water, or any antiseptic, through the Eustachian tube (GROSSARD, *Journal of Eye, Ear, and Throat Disease*, October, 1897) we consider irrational and irritative, and therefore promotive of mastoiditis.]

Pus in the Lateral Ventricle.—A remarkable and fatal result of acute otitis media has been observed by A. LEVY (*Archiv f. Otol.*, July, 1897) in a man who recovered from the acute ear-disease in a month. Two weeks later he was seized with moderate pain in the previously diseased ear, which lasted for one day, and was succeeded by pain in the abdomen, vomiting, and slight fever. A week later there ensued stupor, vertigo without headache, coma, and death. The autopsy revealed caries of the lower part of the petrous bone and pus in the lateral ventricle. The middle ear was normal, except for the swelling of the mucous membrane.

Otitic Pyæmia.—Two cases of otitic pyæmia resulting from acute otitis media in young subjects, aged twelve and fourteen years, are presented by H. EULENSTEIN (*Archiv f. Otol.*, April, 1898).

The first case proved suddenly fatal from sinus thrombosis, as discovered at the autopsy. Recovery ensued in the second case after a mastoid operation, exposure of the bony wall of the lateral sinus, and removal of its necrotic portions. Pyæmic temperature continued for a week. The sinus was not opened, but Eulenstein believes that there existed in this instance simply a parietal thrombus from inflammation of the bony wall of the sinus.

Acute Leptomeningitis.—Acute leptomeningitis, following acute purulent otitis media, and proving fatal on the seventh day of the illness, is reported by J. F. WOODWARD (*New York Medical Journal*, October 9, 1897).

Acute Mastoiditis with Extradural Abscess.—HENNEBERT (*Ann. des Mal. de l'Oreille*, January, 1898) reports acute mastoiditis following acute otitis media, productive of an extradural abscess in a man, aged fifty years. Entire recovery ensued upon opening the mastoid and draining the extradural abscess. A noteworthy symptom in this case was the entire absence of fever during the entire course of the disease. Pain and swelling in the mastoid with cerebral symptoms led to the exploration and operation.

Retropharyngeal Abscess.—Retropharyngeal abscess in very young children, from two months to two years old, as a result of suppurative otitis, has been observed by CLOPOTT (*Arch. of Ped.*, November, 1897). The principal symptoms are those of interference with respiration and deglutition. There is often swelling at the angle of the jaw. Clopott advises that the abscess should be incised internally, discharging into the mouth.

[There seems to be some danger of septic pneumonia if pus is permitted to escape into the mouth, and therefore if a retropharyngeal abscess of otitic origin can be evacuated externally near the angle of the jaw it is, in our opinion, a better method.—ED.]

Torticollis.—Torticollis in connection with acute purulent otitis media, relieved quickly by paracentesis and free outlet of pus confined in the drum-cavity, has been observed and reported by R. HAUG (*Archiv f. Ohrenh.*, September, 1867, pp. 17 and 22). Gelle reported some years ago a number of cases of torticollis in children as dependent upon acute inflammation of the ear, and advised in all cases of torticollis in children to inspect the ear.

Facial Paralysis.—Facial paralyzes, often lasting for several months, may disappear entirely. Some months later in such cases facial contractility may become augmented, as in two cases recorded by URBANTSCHITSCH (*Austrian Otol. Soc.*, November 30, 1897; *Ann. des Mal. de l'Oreille*, May, 1898). POLITZER (*Austrian Otol. Soc.*, October 26, 1897; *Ann. des Mal. de l'Oreille*, March, 1898) has observed a case of traumatism of the skull, followed by hemorrhage from both ears and bilateral facial paralysis, without marked alteration in the hearing. It is supposed that a fracture of both temporal bones occurred, running through the postero-superior walls of both auditory canals and the posterior walls of the tympana, and thus through the Falloppian canal. Politzer expected the facial paralysis to disappear under iodides, iodine inunctions of the mastoids, and galvanization of the nerves of the face.

Facial paralysis of otitic origin may be attended with ascending degeneration, finally affecting the tenth, eleventh, and twelfth nerves by propagation of the process from the facial to these neighboring nerves by means of the bulb, as observed in a drunkard, by G. GERONZI (*Ann. of Otol., Rhin., and Laryn.*, November, 1898).

Middle Ear in Diabetes.—Suppuration of the middle ear and mastoid in the late stages of a fatal case of diabetes mellitus is reported by O. KÖRNER (*Archives of Otol.*, October, 1897). The mastoid involvement was diagnosed only by the *dulness on percussion* of the affected side, the opposite bone emitting a normal bony resonance on percussion. No operation could be performed on account of the advanced diabetic state of the patient.

Middle Ear in Bright's Disease.—MORF (*Zeitschr. f. Ohrenh.*, Bd. xxx; *Archiv f. Ohrenh.*, December 17, 1897), accepting the statement of Dieulafoy that in nearly half the cases of nephritis ear affections occur, has observed twenty-four cases of nephritic ear disease. In the presence of functional anomalies in the auditory apparatus, without other demonstrative causes the urine should always be examined. If a physical aural lesion is present in a nephritic subject, the ear as well as the kidney must be treated. If there is only a functional disturbance in the ear in nephritis, it will usually disappear under renal treatment.

Middle Ear in Syphilis.—HENNEBERT (*Ann. des Mal. de l'Oreille*, January, 1898) maintains that acquired syphilis of the ear is rare and often unrecognized. Syphilis of the external and middle ear generally yields to specific treatment, but syphilis of the labyrinth, the internal ear, presents an unfavorable prognosis. Hereditary syphilis is often the cause of disease of all parts of the ear, according to BROECKAERT (*Ann. des Mal. de l'Oreille*, January, 1898). There are then symptoms of syphilis in such cases, so that the diagnosis and treatment become clear. In the treatment of syphilis of the ear pilocarpine proves efficient, according to the experience of Broeck-aert and others, if applied early in the disease.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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House Quarantine of Yellow Fever.—In an able paper on the "Quarantining of Houses for the Prevention of the Spread of Yellow Fever" PROFESSOR S. E. CHAILLÉ (*New Orleans Medical and Surgical Journal*, May, 1898) vigorously opposes the practice and the claim that the experiment which was tried for the first time in New Orleans in 1897 diminished the number of cases and reduced the number of deaths, and advocates instead the isolation of the sick in hospitals, the removal of those who have been exposed to infection to a camp of detention for five full days, and the thorough cleans-

ing and disinfection of the house and premises. The objections to house quarantine are that it causes great popular dissatisfaction and discourages prompt diagnosis and notification, that the execution of measures successful in hospitals is much less practicable in most houses, that even in the best houses isolation is exceedingly difficult as to attendants and relatives, that in many houses neither proper rooms nor attendants can be provided, and that in the crowded lodging-houses efficient isolation is hopeless. Attendants may be negligent, visitors' clothing may become infected, and thus cause further spread; there is temptation to violate the restrictions and to conceal sickness; inmates escape from the house before and during quarantine, and the well inmates are deprived of necessary occupation.

Treatment of the sick in isolation hospitals, where every precaution of disinfecting all discharges may be observed, and where indiscriminate ingress and egress can be controlled and prevented, is shown to be quite free from the danger of spreading the disease from the sick to the well. In every year when yellow fever has prevailed in New Orleans there have been instances of many non-immunes exposed to the sick in hospitals, asylums, convents, and jails, without one of them being attacked even after weeks of exposure. In 1897 there were at the Touro Infirmary 105 cases with 10 deaths. Twenty non-immune students and nurses constantly in attendance, and about a hundred patients with other diseases, escaped without a single case; but not one of these people was permitted to go out and return and run the risk of becoming infected outside. At the same time, at the Isolation Hospital, 202 cases were admitted, of whom 45 died. Eighteen non-immunes were long exposed to the sick, and more than a hundred workmen were temporarily exposed, and not one of this number was attacked. The preventive measures adopted included prompt and thorough disinfection of all excreta from the sick; thorough cleanliness of the body, the clothing of the sick and of bedding and all personal effects, as well as of the house and premises; free exposure to the sun's rays; and non-intercourse between those inside and those outside the hospital.

The indispensable prerequisites for stamping out any epidemic disease are prompt diagnosis and prompt notification; but in the case of yellow fever the authorities are hampered by the reluctance of the physician to report a mere suspicion of the disease on account of the danger of injury to his practice and of alarming the public and arousing the hostility of those engaged in commerce.

Opposing the claim that, even though the quarantining of houses was admittedly a partial failure, its effect was to keep down the number of cases and of deaths, he calls attention to the fact that no great epidemic has ever resulted when the first cases appeared later than June, and that whenever the first cases have occurred after July there have never before followed as many deaths as the 298 of 1897, in which year the first death occurred in September, and this in the face of the fact that until 1867 no measures were taken to prevent its spread; that until 1879 isolation of the sick was never attempted, and that until 1897 quarantine of both sick and well in houses had never been tried. For fifteen years prior to 1897 New Orleans had been free from the disease, the last cases occurring in 1882, when there were four deaths, and the escape of the city at that time from an epidemic was attrib-

uted by Dr. Joseph Jones, the President of the State Board, to isolation of the sick and thorough cleansing and disinfection of the section surrounding the focus of infection for at least four blocks each way.

Dr. Chaille quotes approvingly from Dr. Kohnke's report, which recommends that, instead of quarantining in a house with the sick all of the inmates who are well, the bread-winners should be permitted to come and go under strict precautions as to disinfection, care of clothing, and place of sleeping. Not of the least importance is the dissemination of sanitary knowledge among the people, especially a knowledge of the infective nature of the disease, its disastrous results to the public, the preventive measures indispensable for its extinction, and the necessity for serious restrictions on the sick-room and for some restrictions on the well inmates of the house.

Meat Poisoning.—A new organism connected with the production of poisonous effects due to the ingestion of diseased meat has been discovered by DR. G. WESENBERG (*Zeitschrift für Hygiene und Infektionskrankheiten*, September 23, 1898, p. 484), who investigated an outbreak at Mansfeld, in which sixty-three persons became ill after eating the meat of a cow which had been killed in consequence of a diagnosis of traumatic pericarditis. Only those who ate of the minced meat in a raw state or of the partly cooked liver were affected; those who ate of the well-cooked meat escaped without exception. The symptoms were vomiting and diarrhœa, violent headache and abdominal pain, general muscular weakness, dizziness, and lassitude. The discharges were sometimes greenish, sometimes brownish, and always extremely offensive. With few exceptions the symptoms abated in from three to five days, and all recovered except one, and that a doubtful case in a child who was not known with certainty to have partaken, and whose symptoms might have been due to other causes.

The unconsumed meat when received for examination was already fairly well advanced in decomposition and partly maggoty. All except one piece, which was faintly acid to litmus paper, was alkaline in reaction. Cultures on agar and in bouillon were made from a piece taken from a part which was apparently not yet in process of decomposition. Inoculation of the bouillon cultures and of small bits of the meat into white mice produced fatal results, in some cases from eighteen to twenty-eight hours and in others within three days. A guinea-pig which received a subcutaneous injection of the bouillon culture of the crushed meat died in forty-eight hours, having shown marked lassitude and profuse diarrhœa. Section showed in all cases enlargement of the spleen, which was bluish-red in color, strong injection of the small intestine, and marked redness of the medullary substance of the kidneys. Cover-glass preparations from the spleen showed fairly long and broad bacilli, and the same organisms were developed on agar from the meat itself. The characteristics of the bacilli as to growth, development, staining, etc., are given in detail. The organism proves to be quite different from any hitherto described by Van Ermengem and others who have investigated similar outbreaks. No examinations of the vomitus or stools were made, because all the persons affected had recovered before the investigation was begun. That the outbreak was due to an infection rather than to an intoxication was shown by the facts, first, that those who ate of the meat in a well-

cooked condition escaped; and, second, that mice withstood injections of 1 cm of heated bouillon culture, but were killed by 0.2 c.cm. of the culture when it was not so treated.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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On the Hæmocytoza of Birds.—OPIE (*Journal of Experimental Medicine*, January, 1898) examined 125 birds. The majority of them were obtained from places notoriously malarial; 80 of these were English sparrows, and 12 red-winged blackbirds; the others belonged to a variety of species. Fifteen of these birds showed intra-corpuscular parasites in varying abundance.

He distinguishes two varieties which correspond to those described by Grassi and Felletti. The morphology of the full-grown organism is characteristic of each group. In one an irregularly shaped body containing pigment granules occupies one end of the red corpuscle, while the nucleus is displaced from its normal central position into the opposite end. The other group is characterized by the fact that the full-grown parasite is an elongated pigmented body lying along one side of the nucleus and curving more or less over its two extremities. This is the *Halteridium* of Labbe. Both develop from very small non-pigmented spherical bodies. In three birds these two varieties were present at the same time. The first or irregular parasite, the *Proteosoma* of Labbe, is represented in its earliest phase by a rounded clear body within the red corpuscle. As the parasite grows it acquires pigment, which is collected into a more or less loose clump situated near the periphery. This collection of pigment into a single clump is characteristic of the *proteosoma*. Amœboid movements were not seen, but they probably occur. Not infrequently two parasites were present in the same corpuscle. As the parasite increases in size the nucleus is deflected, and not infrequently lies at right angles to the long axis. This is not due to the pressure exerted on the nucleus by the organism.

Parasites may be seen surrounded by the rim of a red blood-corpuscle from which the nucleus has been extruded. The process of segmentation is very similar to that found in the malarial parasite in man. The parasite first forms a rosette, and the segments of this become free. In fresh specimens of blood slight clumps of pigment surrounded by groups of small spherical bodies may be seen free in the plasma. The segmenting bodies correspond in size with the larger full-grown organisms. They did not seem to undergo a cyclic development in groups as is the case in malaria, but in the same specimen of blood may be found representatives of all stages. Flagellate bodies resembling those seen in human malaria were met with a number of times. The flagella were similar in appearance to those which occur in the

malarial parasites in man. The second variety of parasite, the Halteridium of Labbe, is very different from the irregular form just described. This form was found in the English sparrow, the song sparrow, and the crow. The youngest closely resemble corresponding forms of the irregular parasite. Amœboid movements were not observed. When the corpuscle reaches a certain size it extends around and hugs the nucleus. The large parasites take a deep stain which is not homogeneous, but which is due to small chromatophilic granules. Beside the forms which stain deeply there are other forms which are almost unstained. He does not think that reproduction of this elongated form takes place in the circulating blood, although Labbe has described it. The process of flagellation is easily seen in the Halteridium. Certain of the full-grown bodies which lie in a curved form alongside of the nucleus are seen to collect themselves into an oval, then into a circular form, causing a protrusion from that side of the corpuscle containing it. Then the corpuscle fades away and the round organism is left free. From this the flagella rapidly develop. The liberation of the parasite appears to be the consequence of the changes that take place in the blood as the result of the abnormal conditions produced in making the specimens. Not all the free organisms develop flagella.

He observed certain differences in the Halteridium which suggest the possibility of the existence of different species.

Upon the Existence of a Minute Micro-organism Associated with Cases of Progressive Portal Cirrhosis.—J. G. ADAMI (*Montreal Medical Journal*, 1898) first calls attention to the Pictou cattle disease in which there is a peculiar extensive cirrhosis of the liver, accompanied by swelling of the periportal and retroperitoneal lymph-glands, with some ascites and multiple follicular ulceration of the true stomach. Micro-organisms which are very difficult to stain are found in the tissues. In one case of atrophic portal cirrhosis in man he obtained from the liver by culture an extremely minute diplococcus which stained with great difficulty. In the same case he found micro-organisms in considerable quantities in the tissues. These were of the same general character as those which he had previously seen in the Pictou cattle disease, but were much smaller. The same organisms were also found in the abdominal lymph-glands. In order to demonstrate the organisms sections of the tissues are first placed in weak acetic acid, then in absolute alcohol, and stained in a solution of methylene-blue and aniline oil. Bacteria are found both in the newly formed connective tissue and in the liver cells. He has found these organisms in a number of cases of portal cirrhosis obtained from different sources.

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
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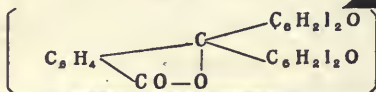
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THE
AMERICAN JOURNAL
OF THE MEDICAL SCIENCES.

DECEMBER, 1898.

THE COMPARATIVE ANATOMY AND EMBRYOLOGY OF VERTEBRATES AS AIDS IN THE TEACHING OF HUMAN ANATOMY IN THE MEDICAL COURSE.¹

BY GEORGE S. HUNTINGTON, M.D.,
NEW YORK.

I FEEL some diffidence in addressing the Association on the subject of my title, for I have before me, through the courtesy of Prof. Wilder, papers and pamphlets dealing more or less definitely with the general question involved, written by Hyrtl, Waldeyer, and Turner among foreign anatomists, and by Wilder, Allen, Baker, and Minot among our own countrymen, and the list proves that the matter has received due thought and consideration at the hands of the ablest investigators and teachers of our science. If, notwithstanding, I bespeak some of your time and attention, it is not because I wish to repeat what has already been said by the eminent men quoted far better than I could hope to express it, but because the question is a many-sided one, and because I desire to emphasize certain aspects of the same in their practical bearing on anatomical instruction at our medical schools.

I may state at the outset that I do not propose to discuss the question whether comparative anatomy should be included as a separate department of study in the medical course;² but, as my title indicates, I wish

¹ Read before the Association of American Anatomists, Tenth Session, at Cornell University, December 30, 1897.

² Wilder, Burt G. Should Comparative Anatomy be Included in a Medical Course? New York Medical Journal, October, 1877.

Wilder, Burt G. The Anatomical Uses of the Cat. New York Medical Journal, Oct. 1879.

Turner, William. Address at the opening of the Anatomical Department in the new medi-

to bring before you the employment of both comparative anatomy and embryology of vertebrates as aids in instructing medical students in human anatomy. Nor do I desire to speak of the advantages of *preliminary* work in comparative anatomy and embryology to students intending to enter the medical curriculum, beyond adding my testimony to the effect that the value of such preliminary work cannot, in my experience, be overestimated. I have occasion annually to compare the work and progress of a large number of students from all parts of the country and to note that almost without exception the men who early demonstrate their ability are those who have received practical biological training during their college course.

The questions which I wish to present for your consideration deal with the situation which confronts us, I believe, at the majority of our large centres of medical education, where students, differing necessarily widely in mental attainments, quantity as well as quality of preliminary training, meet to enter the medical curriculum, and are almost at once introduced to the study of human anatomy.

I may add that we have at Columbia during the past six years earnestly and systematically employed in our instruction in human anatomy the aids which the development and morphology of the lower vertebrates offer, so that the method upon which I can report to you has, to a limited extent, stood the practical test of experience.

The advances of the last decade in the biological sciences have changed and modified, in important and vital details, the method and scope of morphological instruction. Among the special departments in our large universities the one charged with teaching the structure of the human body to medical undergraduates should perhaps be the first to avail itself of these wider views and broadened fundamental lines. Human morphologists have long occupied a peculiar position in relation to their subject of study. For over two centuries the most minute and painstaking care has been bestowed on the investigation of man's structure, both the gross anatomy and the histology of his tissues receiving exhaustive attention. The results, embodied in almost countless volumes and pamphlets, make man to-day morphologically the best-known vertebrate.

cal building of the University of Edinburgh, October 27, 1880. Reprinted from the *Lancet*, November 6 and 13, 1880.

Minot, Charles Sedgwick. A Grave Defect in our Medical Education. March, 1882. Reprint.

Baker, Frank. The Rational Method of Teaching Anatomy. Read before the Biological Society of Washington, D. C., November 30, 1883. *New York Medical Record*, April 19, 1884.

Waldeyer, Prof. Dr. Wie soll man Anatomie lehren und lernen? Rede gehalten zur Feier des Stiftungstages der Militär-ärztlichen Bildungsanstalten am 2. August, 1884. Berlin, 1884.

Baker, Frank. What is Anatomy? A lecture delivered October 5, 1887, at the opening of the anatomical course at the Medical Department of the University of Georgetown, Washington, D. C. *New York Medical Journal*, October 22, 1887.

Allen, Harrison. Addresses in Anatomy: I. Comparative Anatomy as a Part of the Medical Curriculum. II. On the Teaching of Anatomy to Advanced Medical Students. Philadelphia, 1891.

This accrued knowledge is at our disposal, and is receiving constant additions, as from time to time one field after another of human anatomy is revised and studied with modern methods of investigation. I believe that our duty as teachers of this knowledge requires us to take cognizance, thoroughly and systematically, of the structural relationship of man to the remaining vertebrates; to incorporate comparative anatomy and embryology more completely in our course of instruction to medical students to a degree and in a manner which the following pages will present briefly for your consideration.

In the first place I believe that we should not lose sight of what we may term the liberal scientific education of our students, as opposed to the acquisition of purely technical professional knowledge. Even a few years ago many fundamental facts of comparative anatomy and evolution were the scientific property of a limited number of special investigators. But with the general growth of education, especially within the direct sphere of influence of our large universities, much of this knowledge has become diffused among the laity. It is almost superfluous to mention the wide educational effect of institutions like the American Museum of Natural History, the Army Medical Museum, or the National Collection.

In his relation to the community at large the physician is still *par excellence* the man of science, and I believe that as a matter of general scientific education he should possess a knowledge, founded on his university course, which will enable him to give information and express intelligent opinions on vertebrate morphology in general and in relation to the structure of man.

But, aside from this general aspect, the study of comparative forms is of the greatest possible practical benefit to the medical student. I vividly recall my own student days, and I cannot but sympathize with the feeling, more or less akin to despair, with which many students begin to apply themselves to the minute details of structure taught in human anatomy. It seems to me that it is wise to compare our system of instruction with that usually adopted in some other branches of scientific and mechanical education. It would be universally acknowledged a wrong course of procedure if a student of mechanical engineering were taught the constructive details of a modern locomotive, or of the quadruple expansion engines of an ocean steamer, before he had been offered the opportunity of examining and studying the simple piston, cylinder, or boiler; or if a course in electricity commenced with the dynamo, before taking up the magnet. And yet I believe that in many respects we err in the same direction if we place before our students the multitudinous details which the structure of a highly developed and specialized vertebrate like man offers, without availing ourselves of the advantages which the comparison with simpler and more evident forms

possesses both in respect to morphology and the physiological application of structure to function.

I am aware that in the last years much progress has been made in the direction indicated, especially in the teaching of human anatomy from the developmental stand-point. My plea to-day is for the further elaboration of this method and for the systematic use of comparative anatomy in teaching the structure of the human body to medical students.

Even with the best intentions it is not always possible fully to utilize the help which embryology offers in explaining the details of complicated adult human structures. I believe firmly that lasting knowledge is only attained by bringing the student into direct contact with the object of his study. The very nature of embryological methods presents difficulties in this respect, for practical laboratory work in embryology is a *sine qua non* for successful instruction, and drawings or models, schematic or otherwise, do not replace the actual object if we seek to elucidate adult structures by developmental facts. Hence comparative anatomy steps in to fill an important gap in our available methods, enabling us to present in tangible shape the fundamental facts in the development of the higher mammalian forms, our own included, by properly selected preparations of lower types which preserve throughout life morphological conditions that are temporary and evanescent embryonic stages in the higher forms. Where possible, I believe a course of practical laboratory embryology should be offered to medical students, and my ideal of such a course would be one which puts into each student's hand preparations designed to illustrate, as they do forcibly and unequivocally, the main structural facts as permanent conditions in the adult lower vertebrates, while he is studying, microscopically, by section or reconstruction, the same conditions as temporary embryonal stages in the development of the higher forms. We tell our students that the mammalian pancreas develops as a double diverticulum of the duodenal loop, and thus explain the connection of the pancreatic ducts with this portion of the intestinal tract. I believe that this fact would impress itself far more permanently if at the same time they were able to examine a selected series of pancreatic structures and pyloric cæca, beginning, for instance, with the double diverticulum of *Lophius* and working through representative Teleost types to the pancreas of higher forms. The very fact of the morphological variations and the probably different physiological adaptations encountered in this portion of the intestinal tract in lower vertebrates, together with the variations in the arrangement of the pancreatic and biliary ducts in mammalia, render a serial study of this kind all the more valuable. Again, I know of no method which will teach the medical student in a short time more about the structure of the penis than to demonstrate to him a series of reptilian copulatory organs, where at a glance he can see the morphological

principles underlying the development of the mammalian corpus spongiosum and urethra, conditions which he will invariably recall when he examines his first clinical case of hypospadias. I cannot burden you with further examples; they suggest themselves by the score; but I believe you will agree with me if I add that one demonstration of the simple carnivore or marsupial intestinal tract and peritoneum is worth tons of colored chalk and acres of blackboard in elucidating the mysteries of the "greater and lesser sac."

So much, briefly, for the connection of comparative anatomy with the practical laboratory course in embryology. If I may trespass further on your time, I should like to point out what in our experience has proved the proper place for the introduction of comparative anatomy into the general course on adult human anatomy.

I may state again, that in constructing the anatomical course at Columbia the guiding principle has been found in the conviction that the student will gain his lasting and valuable knowledge only by direct study of the cadaver. We have broken—I hope for good and all—with the didactic lecture in anatomy as commonly understood, and I may take a moment to outline our procedure, because it directly involves the question in hand. The first-year student attends no lectures in anatomy. During this year the instruction consists of practical demonstrations to small sections of the class, dealing with the anatomy of the extremities, the osteology, myology, and angiology of the head and neck, including the cervical plexus, and in direct connection with the demonstrations abundant practical work in the dissecting-room. The first-year student also attends a series of demonstrations forming what we term the "Preliminary Visceral Course," designed to afford that general information regarding the body cavities and contents which is required for the correct appreciation of the instruction offered by the Departments of Physiology and Histology.

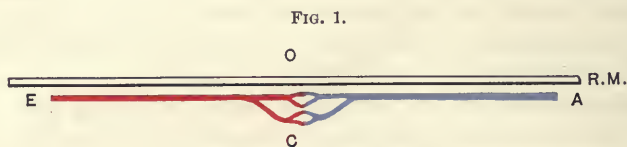
In the second year, the laboratory work continuing, the student attends demonstrations to sections of the class in the anatomy of the central nervous system, organs of special sense, and cranial nerves.

The entire second-year class attends three lectures a week on the anatomy of the body cavities and viscera. The preparations illustrating these lectures are, in the afternoons of the lecture days, demonstrated again separately to sections of the class, enabling each man carefully to inspect and study the same. In this way the opportunity is given of making the anatomical lecture what, in my opinion, it should strive to be—not an attempt to teach anatomy at long range to three hundred men at once, but an occasion for presenting a general view of the broad morphological principles which underly the construction of organs, apparatus, and systems. It is here that the significance and importance of the structural peculiarities of man can best be accentuated

and illustrated in all their bearings by comparison with the morphology of the lower vertebrates. A series designed to teach the evolution of a complicated human organ, through successive stages from the simple and rudimentary form found in the lower vertebrates, or, conversely, the phylogenetic history of a human vestigial organ serially illustrated, attracts the student's attention and interest from the outset. He is offered actual facts and preparations, not dry statements or schematic drawings, and the knowledge cannot fail to be more readily acquired and more thoroughly assimilated. "Seeing is believing," in anatomy as elsewhere. At times, in dealing with broad general themes and subdivisions of the subject, as the genito-urinary tract, the digestive system, etc., I find it desirable to present a bird's-eye view of the structures under discussion by bringing before the students series of representative forms from all the vertebrate classes and orders before proceeding to details. Here the projection of photographs of the actual preparations by means of the lantern gives excellent satisfaction, although it does not, in my opinion, replace the personal examination of the object at close range.

I may conclude by outlining, in the case of a single organ, the scope and extent of the comparative method as we have used it profitably in practice. I have selected the lung, because a subsequent communication which I have to make to the Association on the mammalian eparterial bronchial system will enable me to present my illustration in a somewhat more complete form.

We begin our study of the respiratory system with a brief consideration of the physiological significance of the structures involved, as illustrated by the following scheme (Fig. 1).



Scheme of respiratory apparatus.

R.M. Respiratory membrane. A. Afferent vessel. E. Efferent vessel. C. Respiratory capillary net-work. O. Medium containing oxygen.

In addition to tegumentary respiration two general types of vertebrate respiration are to be recognized, depending upon the character of the oxygen-medium, whether water or air, and presenting corresponding structural modifications:

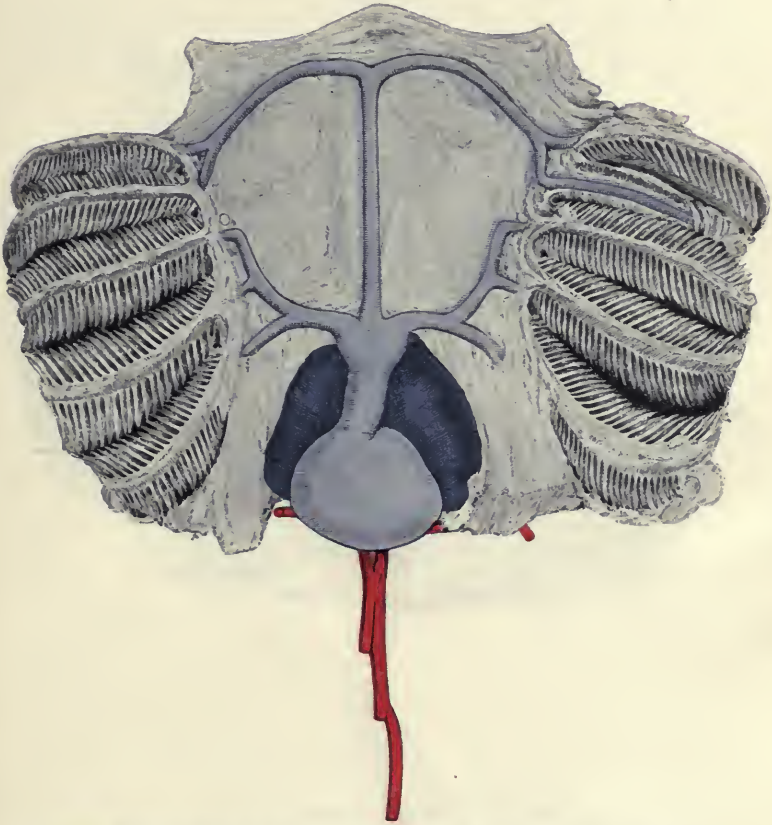
1. Medium: Water; respiratory organ: gills.
2. Medium: air; respiratory organ: lung.

We begin with respiration and the connected portion of the circulatory system in a representative fish, and select the selachian skate (*Raja*

ocellata) because it affords peculiar facilities for demonstration (Figs. 2 and 3).

The afferent arterial system proceeds from the truncus arteriosus of the single-chambered ventricle, dividing into caudal and cephalic branches, of which the former supplies three, the latter two branchial arteries to the gills (Fig. 2). These vessels carry venous blood returned

FIG. 2.

Heart, afferent branchial arteries, and gill-arches of *Raja ocellata*; ventral view.

to the heart by the ducts of Cuvier emptying into the single auricle. The blood, after traversing the gill capillaries and becoming arterialized, is collected by a corresponding number of efferent branches which pass caudad and mesad on the dorsal aspect of the œsophagus, uniting to form the aorta which distributes the blood to the body, to be returned by the systemic veins to the auricle of the heart (Fig. 3).

The type here represented can be reduced to the following scheme (Fig. 4).

If now we assume that one gill on each side (the fifth) is replaced by a lung in the evolution of air-breathing vertebrates, and the corresponding arterial arch (the fifth) divided by the aortic septum from the systemic artery and converted into a pulmonary artery, the remaining four gills being no longer required, the continuity of the four cephalic arte-

FIG. 3.



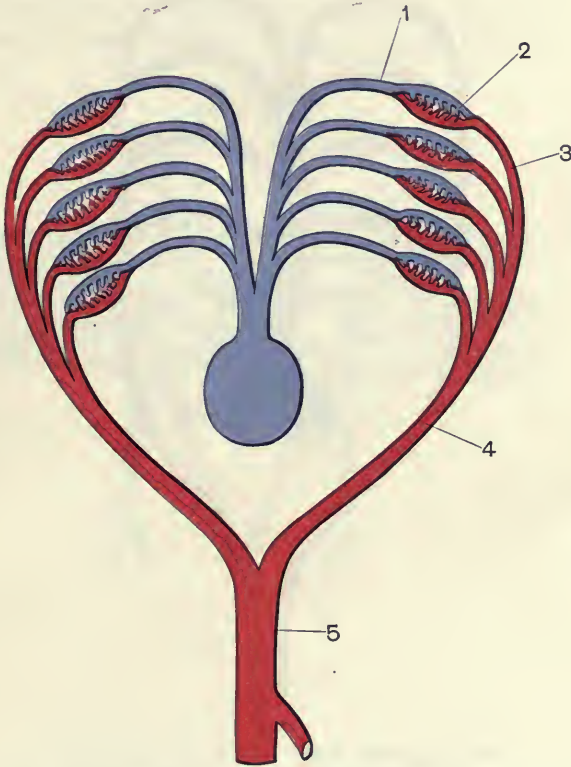
Dorsal view of gill-arches, efferent vessels, and aorta of *Raja ocellata*.

rial arches will be restored. We will then have, with the divided heart and truncus arteriosus necessitated by the establishment of a pulmonary respiration, the following arrangement, which will be recognized as the

fundamental type-plan in the development of the arterial system of all lung-breathing vertebrates.¹ (Fig. 5.)

That the above assumption is justified is shown by the arrangement of the circulatory system in the perennibranchial amphibia; and the lung-fishes, and the circulatory system of *Necturus* and *Menopoma*, as well as that of *Ceratodus*, are here introduced as demonstrative objects. (Schematically represented in Figs. 6, 7, and 8.)

FIG. 4.

Scheme of circulation of *Raja ocellata*.

1. Afferent branchial artery. 2. Capillary net-work of gill. 3. Efferent branchial artery.
4. Aortic root. 5. Aorta.

The points which our consideration of the subject so far has developed may be summed up as follows:

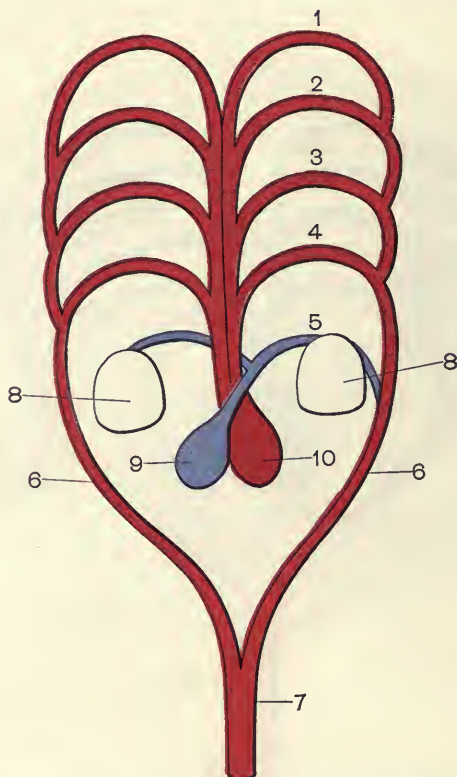
1. Unity of structural plan in all vertebrates.
2. Physiological equivalence of gill and lung.

¹ The development of the heart and arterial system has been considered in the course prior to the taking up of the respiratory system.

3. Pulmonary respiration and the necessary concomitant changes in circulation *cause* the transformation of the simple two-chambered (venous) fish heart into the four-chambered (arterio-venous) heart of the higher air-breathing vertebrates.

4. The arterial arches pass ventro-dorsad around the foregut, uniting to form the aorta on the dorsal aspect of the canal.

FIG. 5.



Scheme of circulation in a lung-breathing vertebrate.

1-5. Aortic arches. 6, 6. Aortic roots. 7. Aorta. 8, 8. Lungs. 9. Right (pulmonary) ventricle. 10. Left (systemic) ventricle.

Hence in anomalous persistence of both right and left aortic arches in man the trachea and œsophagus are included within a vascular loop. (Demonstration of correlated human aortic variations.)

We next turn to the derivation of the lung which, as above assumed, supplants the gill. Here again we begin with the type presented by the fish.

The gill-clefts of the fish correspond to the visceral clefts formed during the embryonic stages of the higher vertebrates.

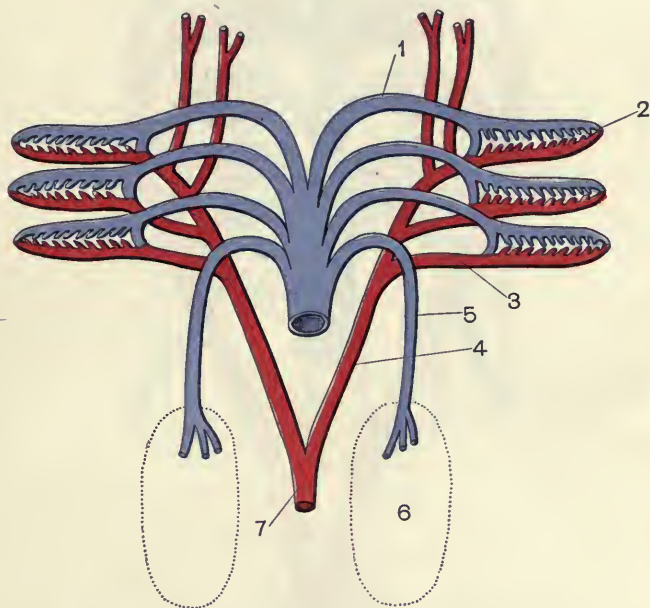
Complete clefts are formed by protrusions from the wall of the fore-gut, pouches extending laterally and finally perforating externally, establishing a passage between the pharyngeal cavern and the surface.

The number and arrangement of the clefts in the fish vary. In the embryos of the higher vertebrates there are usually four or five.

Caudad of the last gill-cleft in the fish an additional protrusion of the wall of the gut forms the "swim-" or "air-bladder," variable in development and purely hydrostatic in function. Three types of the swim-bladder are now exhibited :

1. *Selachian (Raja)*. Bladder absent, except possibly represented by a rudimentary diverticulum of the dorsal pharyngeal wall.

FIG. 6.



Scheme of circulation in the Perennibranchial Amphibia.

1. Afferent branchial artery. 2. Capillary net-work of gill. 3. Efferent branchial artery. 4. Aortic root. 5. Pulmonary artery. 6. Lung. 7. Aorta.

2. *Ganoid (Acipenser)*. Bladder present, connected with the lumen of the œsophagus by a hollow stalk, the *ductus pneumaticus*.

3. *Teleost (Gadus)*. Bladder variable in its occurrence, more or less reduced. The *ductus pneumaticus* persists in a few forms in a rudimentary condition.

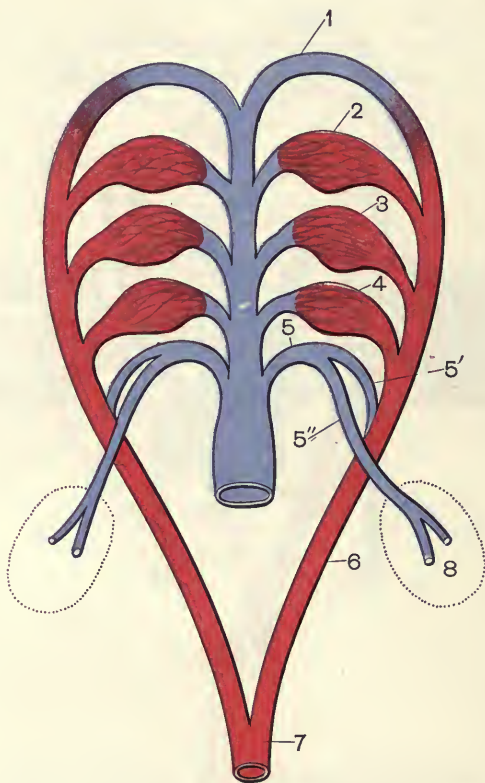
In most forms the bladder loses its original connection with the œsophagus and becomes entirely closed. The contained "air," composed of varying proportions of oxygen, nitrogen, and carbon dioxide, is derived

from the blood, which in the branchial circulation absorbs air from the water and again gives it off from a "rete mirabile" placed on the internal surface of the swim-bladder.

An examination of the cod's bladder demonstrates the following points:

1. A closed sac, no communication with the œsophagus existing.

FIG. 7.



Scheme of circulation in the Dipnoi.

1. Cephalic aortal arch. 2, 3, 4. Capillary net-work of gills connected with 2d, 3d, and 4th arches. 5. Pulmonary arch. 5'. Ductus arteriosus. 5''. Pulmonary artery. 6. Aortic root. 7. Aorta. 8. Swim-bladder or lung.

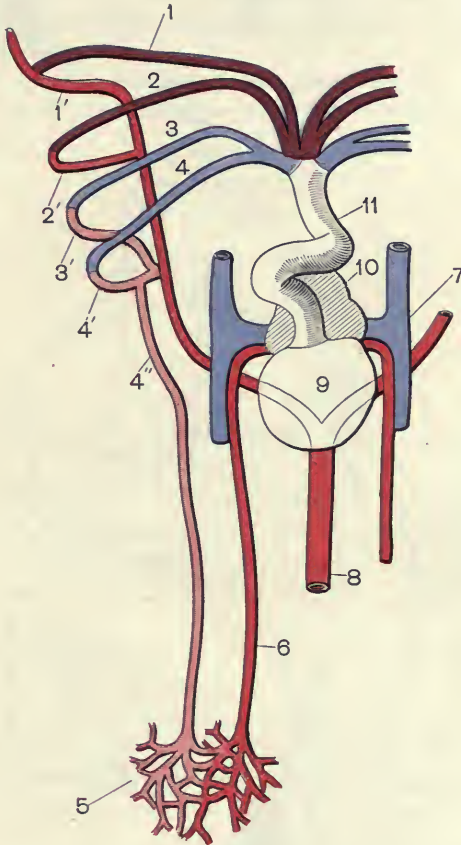
2. Lateral prolongations and blunt processes, resembling the marginal diverticula of some reptilian lungs.

3. Cephalic narrow tubular prolongations, possibly associated with the acoustic apparatus.

4. On the internal surface of the ventral wall the vascular "rete mirabile."

Turning now to the development of the lung in the higher vertebrates, we find that in them the organ first appears as a pouch protruded from the foregut and connected with its lumen by a short and wide canal, just as in the fish the swim-bladder in its original condition continues caudad the series of branchial pouch protrusions from the foregut. (Fig. 9.)

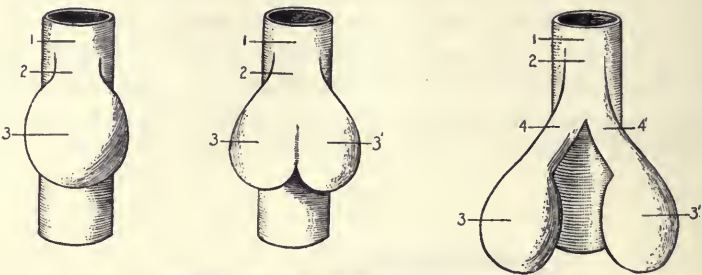
FIG. 8.

Scheme of circulation of *Ceratodus*.

1, 2, 3, 4. Aortic arches. 1', 2', 3', 4'. Gill capillaries of corresponding arches. 4''. Pulmonary artery. 5. Capillary net-work of swim-bladder or lung. 6. Pulmonary vein. 7. Cardinal veins. 8. Aorta. 9. Ventricle. 10. Auricle. 11. Truncus arteriosus.

Hence, both the air-bladder of the fish and the lung of the higher vertebrates is ontogenetically a pouch protruded from the foregut. In its further development the pouch divides, and the canal uniting it to the oesophagus (ductus pneumaticus) lengthens. The divided pouch forms the bilateral lung; the duct becomes converted into the trachea and

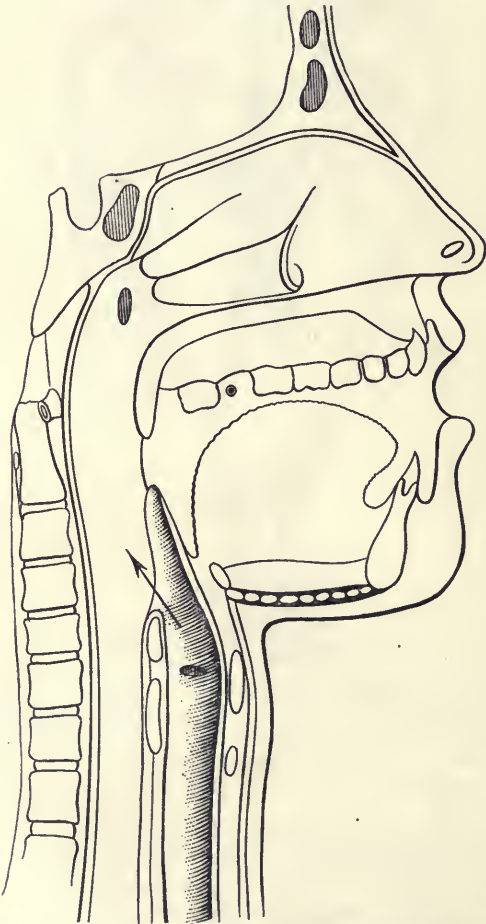
FIG. 9.



Schematic representation of development of lungs.

1. Esophagus. 2. Trachea. 3, 3'. Lungs. 4, 4'. Bronchi.

FIG. 10.

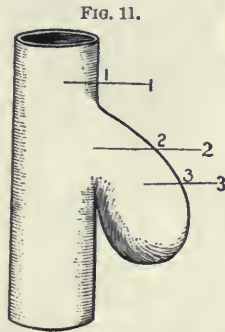


Schematic sagittal section of head and neck, showing connection of laryngeal and pharyngeal canals.

laryngeal apparatus. The connection of the latter throughout life with the cavity of the pharynx preserves the original opening leading from the foregut into the canal of the pneumatic duct. (Figs. 10 and 11.)

The main conclusions which can be based on the foregoing considerations are the following :

1. Both the air-bladder of the fish and the lung of higher vertebrates are, ontogenetically, protrusions of the wall of the foregut. The bladder, usually derived from the dorsal wall, is purely hydrostatic in function. The lung, always connected ventrally with the foregut, is respiratory in function.



Schematic profile of embryo lung.
1. Œsophagus. 2. Trachea. 3. Lung.

2. Both the bladder of the fish and the lung of the higher vertebrate embryo continue caudad the series of the visceral pouches. Hence, phylogenetically, probably both bladder and lung represent a last caudal pair of visceral pouches which have not perforated to form visceral clefts.

The morphological homology of the two structures may be further accentuated by the following considerations :

1. The internal gill-pouches of the cyclostomes. Form demonstrated : *Bdellostoma stouti* (Fig. 12), where the branchial sacs appear as dilatations of a tubular canal connecting the œsophagus with the exterior.

2. The arrangement of the swim-bladder of *Polypterus* (Fig. 13), presenting :

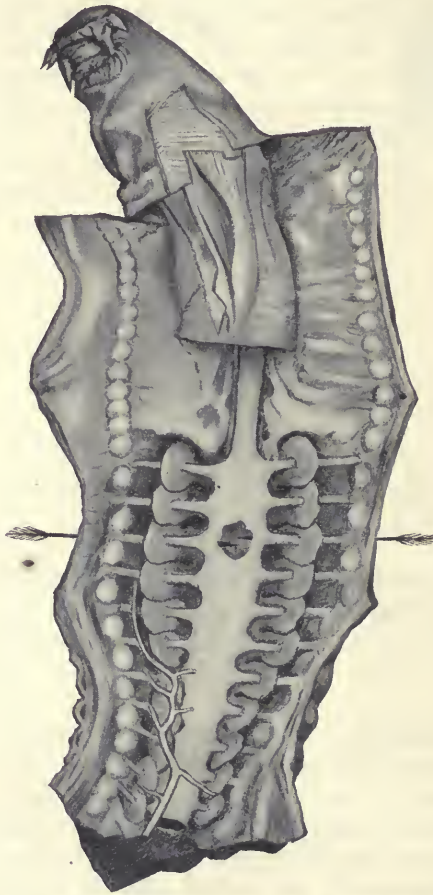
- a. A ventral œsophageal opening.
- b. A laryngeal-like aditus surrounded by a sphincter.
- c. A pneumatic canal, representing the trachea.
- d. A bilobed bladder, the right accompanied by the vagus nerve.

3. The structures in *Lepidosteus*, presenting :

- a. A laryngeal apparatus, connected with the beginning of the pneumatic duct.
- b. A vascular trabecular net-work on the internal surface of the bladder, foreshadowing the batrachian and reptilian lung.

4. The structures in the *Dipnoi*, where the swim-bladder develops directly as a lung, the pulmonary aditus presenting the same arrangement as in other forms the entrance from the œsophagus into the pneumatic duct.

FIG. 12.

Foregut, branchial pouches, and canals of *Bdellostoma stouti*.

The arrows are passed through two of the narrow external openings into the œsophagus, traversing the branchial canals and the internal gill-pouches.

Form demonstrated: *Ceratodus*.

The architecture of the lung is next considered in reference to the bronchial tree and pulmonary vascular supply. The following series is employed in demonstrating the evolutions of the compound mammalian lung from the simple air-sac.

1. *Necturus*. Type of perennibranchiate amphibian lung, consisting of simple thin-walled air-sac.

2. *Rana*. Batrachian lung. Simple sac, with air-cells.

3. *Python molurus*, *Agkistrodon piscivorus*. Ophidian lung, consisting of lung-sac directly continuous with trachea; air-cells and trabeculae in cephalic portion, gradually becoming less and less marked in thin-walled distal portion. Unequal development of right and left lung.

4. *Iguana tuberculata*. Lacertilian lung; air-sac with one complete septal partition and air-cells in cephalic portion, simple in distal portion.

5. *Chelydra serpentina*. Chelonian lung, with complete septal system, dividing lung into bronchial spaces, dorsal and ventral. Monopodic type of division of bronchial and pulmonary vascular system.

6. *Thalassochelys caretta*, *Loggerhead turtle*. Chelonian lung presenting direct transition to type of avian and mammalian lung; a single axial stem-bronchus and pulmonary artery, with monopodic system of division.

The details of structure of the mammalian bronchial tree and pulmonary vascular supply are demonstrated by a series of corrosion preparations, special stress having been laid upon the probable evolutionary stages leading to the asymmetrical arrangement of the right and left bronchial system common to man and most mammalia. I have a subsequent communication on this subject to place before the Association, and will consequently defer the details until the presentation of my second paper.

The detailed morphology of the human respiratory tract is next taken up from the descriptive, topographical, and medico-surgical stand-point. I may add that of the nine lectures which I usually devote to the lungs, two are utilized for the presentation of the comparative and developmental facts above outlined, the remaining seven dealing with the details of structure in man. It is quite apparent that, in order to carry out the system, much time and care must be devoted to the formation of a morphological museum for purposes of illustration. My time and space do not permit me to enter into a consideration of this important subject, the keynote to the solution of the entire problem. But I hope on some future occasion to bring before this Association our plans relating to the formation of a museum of human and comparative anatomy.

I may in conclusion add, in order that I may not give a somewhat erroneous impression, that the department of anatomy at Columbia

FIG. 13.

Swim-bladder of
Polypterus.

1. Larynx-like opening into swim-bladder.

offers laboratory work in comparative anatomy to medical students in the form of special practical courses in which every student makes his own dissections on fresh material and records his observations in notes and drawings. The number of applicants for these courses, which are optional, and the earnest and intelligent character of the work done give ample evidence of the educational value of comparative anatomy in the medical school.

ON NEPHRITIS OF MALARIAL ORIGIN.¹

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(Concluded from page 576.)

Relation of the Time of Development of the Nephritis to the Season of the Year.

TABLE SHOWING THE TIME OF DEVELOPMENT OF 26 CASES.

January	0	August	5
February	0	September	7
March	1	October	6
April	1	November	0
May	0	December	0
June	1		—
July	5	Total	26

It would thus appear that nephritis is much commoner at the height of the malarial season; rare in the early months of the year. Of these 11.5 per cent. only developed before July, while our statistics in 1712 cases as to the time of onset of the symptoms of the malarial infection show that 17.1 per cent. develop during this period. The greater relative frequency of malarial nephritis in the second half year is clearly explained by its predominance in æstivo-autumnal fever.

Edema was present in 19 of the 26 cases.

Blood was noted in the urine in 18 cases; it was absent in 7, while in one instance no note upon the sediment was made.

An exact estimate as to the relative frequency of malarial nephritis is difficult to make. If we take into consideration the entire 1832 cases, it must be remembered that the urine was examined in the out-patient department in rare instances only, when the attention of the physician was definitely called to the possibility of some renal complication. And it is quite possible that cases of true nephritis may, under these circumstances, have escaped observation.

Among these 1832 instances of malarial fever there were 26 cases of acute nephritis, or 1.4 per cent.

¹ Read before the Association of American Physicians, May, 1898.

The following table will show the percentage of renal complications in the different types of fever:

Regularly intermittent fevers (tertian and quartan)	1014	nephritis, 8	0.78 per ct.
Æstivo-autumnal fever	676	" 16	2.3 "
Combined infections	36	" 1	0.9 "

A more accurate estimate of the frequency of nephritis in malaria is probably to be obtained by a study of the cases observed within the hospital—758 in number. The objection might be raised that these cases were, as a rule, somewhat more severe than those observed in the dispensary; but inasmuch as all patients presenting themselves at the dispensary with malaria are recommended for admission, many of the mildest cases entering, this objection is probably not as important as it might appear at first. It is probably safe to say that the figures obtained from the house cases, while doubtless somewhat too high, are less out of the way than those obtained from a consideration of the total number.

Among the 758 cases of malarial fever treated in the Johns Hopkins Hospital there were 21 instances of acute nephritis of probable malarial origin, or, in other words, 2.7 per cent. In three of these instances there is room for some doubt as to whether, possibly, the infection may not have occurred after the beginning of the nephritis. Leaving out these possible doubtful cases, we are then left with a percentage of 2.3 of acute nephritis.

The frequency of acute nephritis in æstivo-autumnal fever was, as might have been expected, far greater than in the regularly intermittent fevers.

In 394 cases of tertian and quartan fever there were six instances of nephritis (1.5 per cent.), or, if we omit the three cases in which there is some doubt as to the etiology of the nephritis, three instances (0.7 per cent.).

Among 296 cases of æstivo-autumnal fever there were fourteen instances of acute nephritis (4.7 per cent.).

Out of 28 instances of combined infections there was one case of acute nephritis (3.5 per cent.).

A comparison of these statistics with those of other observers in other acute infections is interesting.

(a) *Typhoid Fever*. Among 389 cases of typhoid fever we have had 14 instances of acute nephritis, or 3.6 per cent.¹ In none of these cases, however, was œdema present, and in none of the fatal cases was death

¹ The determination of what shall or shall not be called clinically an acute nephritis is of necessity somewhat arbitrary. In our cases of malaria, in the absence of outspoken clinical evidence of acute nephritis, we have included only those instances where the urine showed large quantities of albumin, or where the sediments showed evidence of more or less extensive renal changes in the presence of blood or epithelial casts. The application of this distinction to the cases of typhoid fever analyzed by Hewetson (op. cit.) has somewhat lowered his percentage of nephritis.

apparently due to renal complication. Complete recovery occurred in all patients who did not die from other complications of typhoid fever.

(b) *Scarlet Fever*. The most satisfactory statistics are those of Caiger,¹ who, among 4015 cases of scarlet fever in the London Fever Hospital, observed 3.31 per cent. of instances of acute nephritis, a percentage but little higher than that noted by us in all varieties of malaria, 2.7 per cent.

(c) *Diphtheria*. In diphtheria the frequency of true acute nephritis is difficult to estimate.

Trousseau² observed dropsies in barely 5 per cent. of his cases; Sanné³ in 7, 3.1 per cent., out of 224 instances in which albuminuria was present, or in 1.7 per cent. of all his cases. In our cases of malaria dropsy was present in 4.6 per cent. of the instances in which there was albuminuria, or in 1.9 per cent. of all our cases.

From McCollom's valuable statistics nephritis would appear to be an unimportant complication of diphtheria. But 5.2 per cent. of 633 cases had over 0.1 per cent. albumin in the urine, while œdema was noticed in but four instances. "In the seventy-one autopsies in no one instance was the condition of the kidneys such as to have materially contributed to the fatal issue."

It may then be seen that while albuminuria is more frequent in typhoid fever than in malaria, true acute nephritis with general dropsy and other characteristic symptoms is apparently of greater frequency in the latter affection. And while malarial fever cannot be said to exercise as deleterious an influence upon the kidneys as does scarlet fever, the percentage of acute nephritis among our cases of malaria is more than half as large as that in Caiger's statistics in scarlet fever.

Considering the different types of malarial infection separately, these facts are more strikingly brought forth. The percentage of cases of acute nephritis in our 296 instances of æstivo-autumnal fever is higher than that in any of the above mentioned infections.

	Æstivo-autumnal fever.	Typhoid fever.	Scarlet fever (Caiger).
Percentage of cases of nephritis	. 4.7	3.6	3.5

In comparison to Sanné's estimate that 3.1 per cent. of the albuminurias in diphtheria have dropsy, we have the fact that out of 165 cases of albuminuria in æstivo-autumnal fever, 9 or 5.4 per cent. showed this symptom.

In view of these figures it is difficult to escape the conclusion that malarial fever is one of the acute infections in which acute nephritis is comparatively common. This is especially true of æstivo-autumnal infections, where its frequency, if not its severity, would from our statis-

¹ Op. cit.

² Quoted from Barthez and Sanné, op. cit., p. 457.

³ *Traité de la diphtheria*, 8°, Paris, 1877.

tics appear to be greater than that in typhoid fever and diphtheria and not far behind that in scarlet fever.

The important rôle which malarial fever plays in the etiology of acute nephritis in Baltimore is testified to by the fact that out of 112 instances of acute nephritis observed in the Johns Hopkins Hospital, 21, or 18.7 per cent., were of malarial origin.

All observers agree that there is a great difference in the malignancy of different infections, and our statistics would lead us to recognize the justice of this observation. Fifteen of our twenty-six instances of malarial fever occurred during the summer and fall of 1896 at a time when an unusually large amount of severe malarial fever prevailed.

It is not improbable that the especial malignancy of this epidemic of 1896 may account for the rather strikingly high percentage of instances of nephritis which have come under our observation.

Our statistics would lead us to assume that this complication is more frequent than it would appear to be in Rome from the observations of Rem Picci.

Chronic Nephritis.

What influence, if any, may malarial fever have upon the development of chronic nephritis?

In four instances of acute nephritis observed in the hospital there is some reason to believe that the process may have assumed a chronic course.

The first instance, Case XVI., has already been mentioned among the fatal cases (page 574). The patient died after an illness lasting from six to seven months, with the symptoms of a chronic diffuse nephritis. An autopsy was not permitted. It will be remembered that there was some question in this case as to whether the malaria might not have been a secondary infection developing in a patient already suffering from nephritis. The time of onset of the trouble, the surroundings of the patient, the absence of other etiological elements, make it highly probable that the malarial infection was the primary cause of the disease.

CASE XVII. *Malarial fever; double tertian infection; chronic nephritis; little improvement.*—No. 17,836. A. T., female, colored, aged twenty-one years; admitted November 10, 1896. Family and personal history good. No history of other infectious diseases. The patient suffered in September with chills and fever which disappeared after treatment with quinine for one week, when she believed that she had completely recovered from the infection.

For four weeks she has suffered with œdema of the back and legs, abdominal pain, headaches, cough, and dyspnœa. Two days ago had a chill.

Physical Examination. Marked pallor; general œdema and ascites; right hydrothorax. Heart's apex in fifth space, 12½ cm. from the median line; no accentuation of the second aortic sound. Spleen not palpable.

Blood. Tertian parasites.

Urine. Smoky; 1025; acid; albumin abundant, nearly 1 per cent. Sediment abundant; leucocytes; vaginal epithelial cells; occasional decolorized red blood-corpuscles; numerous hyaline and finely granular casts; some coarsely granular casts, many having small round cells adherent; occasional blood and epithelial casts.

There were slight febrile paroxysms on the 10th and 11th. Under treatment with quinine the temperature became normal on the 13th, and remained so thereafter.

The patient was placed on a milk diet, given diuretics (diuretin, bitartrate of potassium), and iron (Blaud's pills). Frequent hot baths to induce sweating, with and without the addition of pilocarpine hypodermically, were given.

The urine, reduced in amount for the first several days, was normal or slightly increased in quantity thereafter. The specific gravity varied between 1025 on entrance and 1008 on December 2d. For the three weeks before discharge it averaged about 1010. The blood disappeared from the urine by November 18th, but returned again on November 21st. On December 5th patient left against advice, still somewhat oedematous, the urine showing 0.3 per cent. albumin.

In this instance the duration of the case (two and a half months), the persistence of the symptoms, and the continued large quantity of albumin led us to believe that we were dealing with a chronic diffuse nephritis. Unfortunately, we have been unable to learn the subsequent history of the case.

CASE XX. *Malarial fever; æstivo-autumnal infection; acute hemorrhagic nephritis; recovery (?)*.—No. 20,905. G. B., colored, aged twenty years; admitted October 12, 1897. Family history negative. Measles, whooping-cough, and chicken-pox as a child. The patient had suffered for a month with daily and tertian chills. He has been taking quinine, and has had no chills for five days. Two weeks ago oedema of the legs and feet appeared, and a week later became general. The urine has been of a dark color.

Physical Examination. Pallor; general anasarca; point of maximum cardiac impulse in the fourth space, 10 cm. from the median line; pulse of rather high tension; spleen not palpable.

Blood. *Æstivo-autumnal* parasites; pigmented ovoid forms.

Urine. Yellow; acid; 1017; albumin, 0.4 per cent. Sediment: Many uric-acid crystals; many granular, hyaline, and epithelial casts.

There were slight daily febrile paroxysms from the 15th to the 20th, on which date treatment with quinine, 0.325 (gr. v) every four hours, was begun, the temperature reaching normal by the 23d.

The patient was given a milk diet and bitartrate of potassium as a diuretic. Later, iron in the form of Blaud's pills was given.

On October 23d the urine suddenly became smoky, containing red blood-corpuscles; it was somewhat reduced in quantity from the 23d to the 30th, after which time it was steadily above the normal amount, sometimes passing 3000 c.c. The albumin gradually diminished in quantity. The oedema and ascites had disappeared by October 26th. There was no evidence of albuminuric retinitis. There was no cardiac hypertrophy, the point of maximum impulse being in the fifth space, 8.8 cm.

from the median line just before discharge. A slight trace of albumin, however, still remained present in the urine.

On December 23d the patient left the hospital with a trace of albumin yet in the urine, and a few hyaline, granular, epithelial, and blood casts still present.

The patient has been heard from repeatedly since his departure. He believes himself to be well. A specimen of *urine* obtained several weeks ago (April 18, 1897) had a specific gravity of 1018. There was a very faint trace of albumin. Microscopically a few red blood-corpuscles were found in a centrifugalized specimen, as well as one or two coarsely granular casts.

From the patient's letter there would appear to have been a moderate polyuria.

CASE XXI. *Malarial fever; æstivo-autumnal infection; acute hemorrhagic nephritis; recovery* (?).—No. 20,981. C. K., male, aged thirty-one years; admitted October 20, 1897. Family history negative. Had measles as a child and diphtheria(?) at thirteen. For twenty days the patient has had quotidian chills and fever off and on, relieved at times by quinine. Two days ago the legs became œdematous, and there was dyspnœa on exertion. The urine was of a reddish color.

Physical Examination. Pallor; general anasarca; no cardiac hypertrophy; spleen not palpable.

Blood. Æstivo-autumnal parasites; hyaline, amœboid bodies.

Urine. Reddish-brown; smoky; 1015; acid; albumin, 0.4 per cent. Sediment abundant; numerous hyaline, epithelial, granular, and blood casts; red blood-corpuscles, normal and decolorized; epithelial cells.

There was irregular fever for forty-eight hours.

Treatment with quinine was begun on the 21st, and the temperature was normal by the 23d. The patient was given a milk diet and bitartrate of potassium as a diuretic. Later, tr. ferri chloridi, 1.3 (mxx) t. i. d., was also given.

The œdema slowly disappeared, remaining absent after November 15th.

The *urine*, only 700 c.c. in amount on October 21st and 1290 c.c. on October 22d, was afterward continually increased in quantity, the amount at times passing 2500 c.c. The albumin diminished rapidly, but was still present as a trace on discharge. No blood appeared in the sediment after December 24th.

The pulse-tension was rather high, and the second aortic sound was somewhat accentuated, but no retinal changes were to be made out.

The patient was discharged at his own request on January 24, 1898, feeling quite well. The *urine* on this date was clear; acid; 1010. There was a trace of albumin. The sediment still showed a few granular casts.

In both of these instances there is some question as to whether or not the renal changes have assumed a chronic course. In Case XX. the presence of blood and an occasional cast in the urine six months after the onset of the affection testified as to the gravity of the lesions produced by the acute infection, while in Case XXI. the high blood tension as well as the persistence of albumin and casts afforded suspicion of a chronic change.

Case XVII. represented, apparently, a true chronic malarial nephritis,

and, in view of the literature above quoted, there can be but little doubt as to the existence of such cases. Although unable to present any further instances than these mentioned in support of such a view, it is, I think, safe to assume that any infection, the toxicity of which is sufficient to produce as large a percentage of serious acute nephritides as malarial fever, must play a certain part in the etiology of chronic renal changes.

It may probably be considered as a generally recognized fact that scarlet fever, diphtheria, and typhoid fever result sometimes in changes in the kidneys which may lead secondarily to grave chronic nephritis. And such changes are generally supposed to be due to circulating toxic substances produced either directly by the growth of the infectious organism, as in diphtheria, or set free from the bodies of the dead bacteria, as in typhoid fever, or resulting secondarily from the action of such substances on the fluids and tissues of the body.

The surprising frequency of acute nephritis in our cases of malarial fever would appear to be an indication of the extreme toxicity of the circulating poisons present, evidence of the existence of which has been previously brought forward in the grave changes noted by Guarnieri,¹ Bignami,² Barker,³ Monti,⁴ and others in the spleen, liver, and brain. Does it not, perhaps, justify us in considering seriously whether, after all, repeated and chronic malarial infections may not play a greater part in the development of chronic renal changes than we have previously been in the habit of assuming?

SUMMARY. In 758 cases of malarial fever treated in the wards of the Johns Hopkins Hospital albuminuria occurred in 46.4 per cent., and casts of the urinary tubules in 17.5 per cent.

Albuminuria was much more frequent in æstivo-autumnal fever than in the regularly intermittent fevers, occurring in but 38.6 per cent. of the latter, and in 58.3 per cent. of the former, while casts of the renal tubules were found in 12.2 per cent. of tertian and quartan infections and in 24.7 per cent. of the cases of æstivo-autumnal fever.

The frequency of albuminuria in æstivo-autumnal fever is apparently equal to that in diphtheria, though less than in scarlet and typhoid fevers.

Out of 1832 cases of malarial fever in the hospital and in the outpatient department there were 26 instances of nephritis of malarial origin, or 1.7 per cent.

Of these 13 recovered, 4 died, and in 9 the result was doubtful, 3 instances probably becoming chronic. In three of the fatal cases there is a possible doubt as to the malarial nature of the case.

¹ Atti d. R. acc. med. di Roma, 1887, s. ii. vol. iii. 247.

² Ibid., Anno xvi., 1890, s. ii. vol. v. 317.

³ Johns Hopkins Hospital Reports, 1895, vol. v. 220.

⁴ Bull. de Soc. Med. chir. d. Pavia, 1895.

On the basis of these statistics nephritis would appear to occur in from 1 to 2 per cent. of all cases of malarial fever in the neighborhood of Baltimore.

The complication was more frequent and severe in æstivo-autumnal fever; it was commonest during the height of the malarial season, in July, August, September, and October; it was rare in the first half of the year.

The relative frequency of malarial nephritis appears to be much greater in the negro than in the white race.

There is nothing especially distinctive in the clinical characters of the disease. It shows the usual features of an acute toxic nephritis; the tendency is apparently toward a short course and a favorable issue. Severe, fatal, and chronic forms of the disease may, however, occur, two, possibly four, instances of chronic nephritis of malarial origin having come under our observation.

It is impossible on the basis of our small anatomical material to form definite conclusions as to the nature of the lesions in these cases of nephritis. There is little, however, to indicate that they present any specially characteristic distinction.

CONCLUSIONS.

1. Albuminuria is a frequent occurrence in the malarial fevers of Baltimore, occurring in 46.4 per cent. of our cases.

2. It is considerably more frequent in æstivo-autumnal infections than in other forms, occurring in 58.3 per cent. of these instances against 38.6 per cent. in the regularly intermittent fevers.

3. Acute nephritis is a not unusual complication of malarial fever, having occurred in 2.7 per cent. of the cases treated in the wards of the Johns Hopkins Hospital, and in between 1 and 2 per cent. of all cases seen at the institution.

4. The frequency of acute nephritis in æstivo-autumnal fever is much greater than in the regularly intermittent fevers, having been observed in 4.7 per cent. of the cases treated in our wards, and in 2.3 per cent. of all the cases seen.

5. The frequency of albuminuria and nephritis in malarial fever, while somewhat below that observed in the more severe acute infections, such as typhoid fever, scarlet fever, and diphtheria, is yet considerable.

6. There is reason to believe that malarial infection, especially in the more tropical countries, may play an appreciable part in the etiology of chronic renal disease.

Cases.

CASE I.—*Vide* page 570.

CASE II.—*Vide* page 571.

CASE III. *Æstivo-autumnal malaria; acute hemorrhagic nephritis; recovery.*—No. 8126. L. S., aged thirty-one years; admitted September

6, 1893. Family history negative. Had measles as a child. The patient lives in a very malarious district, and had chills and fever three years ago. A week before entry he began to complain of œdema of the legs, dyspnoea, and cough, with tenacious mucous expectoration.

Physical Examination. Marked pallor; moderate œdema of the legs; fine moist râles at the bases of both lungs; no cardiac hypertrophy; pulse of normal tension; spleen palpable.

Blood. Æstivo-autumnal parasites; hyaline amœboid bodies and crescents.

Urine. Dark reddish-brown; opaque; acid; 1021; much albumin. Sediment: Very numerous hyaline, granular, epithelial, and blood casts; red blood-corpuscles, normal and decolorized; leucocytes; epithelial cells.

There were paroxysms of fever on the afternoons of the 7th and 8th; the fever rapidly disappeared under quinine, which was begun upon the 8th. On the 9th and 10th the patient was given four doses of quin. et ureæ muriatis, 0.65 (gr. x) hypodermically. The albumin, at first nearly 0.5 per cent., rapidly diminished to a faint trace on October 18th. No casts were to be found in the sediment after September 30th. The quantity of urine, at first diminished, was always above normal after October 14th. On September 23d the patient was discharged, feeling perfectly well; the urine, however, still showed a faint trace of albumin.

Beyond the quinine, which was administered in doses of 0.325 (gr. v) every four hours from September 9th to 23d, and afterward in doses of 0.325 three times a day, the patient received no medicinal treatment.

CASE IV. *Malarial fever; mixed æstivo-autumnal and tertian infection; acute nephritis; recovery (?)*.—No. 8302. J. J., aged thirty years; admitted October 2, 1893. Family history negative. Always healthy excepting for an attack of malaria two years ago. For two weeks the patient had had daily chills, headache, vomiting. For two days, œdema of the hands and feet, and vertigo.

Physical Examination. Sallow color; marked pallor; moderate general œdema. Arteries slightly thickened; no cardiac hypertrophy; no accentuation of second aortic sound; spleen palpable.

Blood. Mixed infection; æstivo-autumnal and tertian parasites, the former in excess.

Urine. Reddish amber; clear; acid; 1022; distinct trace of albumin. Sediment: Granular and epithelial casts, many cylindroids, few leucocytes.

There were paroxysms of fever on the 2d, 3d, and 4th.

Treatment. Quinine, 0.65 (gr. x), every four hours on the 2d, 3d, and 4th, and 0.325 three times a day from October 10th on.

The temperature, which had shown daily elevations, was normal after October 4, 1893.

October 6th. *Urine.* Dark yellow; acid; 1015; trace of albumin, many large epithelial and hyaline casts, some with blood adherent; few red blood-corpuscles; few leucocytes.

The patient was discharged, apparently well, on the 12th. There was no final note upon the urine.

CASE V. *Æstivo-autumnal infection; acute hemorrhagic nephritis; possible exacerbation of a chronic nephritis; recovery (?)*.—No. 8558. F. L., male, aged thirty-eight years; admitted November 4, 1893. Family history negative. Measles as a child. Typhoid fever fourteen years

ago. Smallpox eight months ago. The patient has had tertian chills off and on for four weeks; relieved occasionally by quinine. For two weeks there has been œdema of the feet and legs, dyspnœa, headache, frequent micturition; ischuria.

Physical Examination. Pallor; marked œdema of the legs; breath urinous; heart slightly hypertrophied; apex impulse in the sixth space just outside the mammillary line; second aortic sound accentuated; radial tension somewhat increased; artery not thickened; spleen palpable.

Blood. Æstivo-autumnal parasites; hyaline, amœboid bodies and crescents.

Urine. Smoky; acid; 1015; albumin, 0.4 per cent. Sediment: Numerous hyaline and granular casts; epithelial casts; red blood-corpuscles; round epithelial cells; few leucocytes.

There was slight fever on November 4th and 5th, disappearing immediately under treatment with quinine, 0.325 (gr. v), every four hours, which was discontinued on the 15th.

The patient was placed on a milk diet and given frequent hot-air baths.

For five days the quantity of urine varied between 500 c.c. and 1200 c.c., after this date being above the normal quantity. The albumin rapidly diminished in amount, the œdema at the same time disappearing. On November 18th a faint trace of albumin was present and a few granular casts; a few red blood-corpuscles were still to be found. On November 23d the patient was discharged, apparently well.

CASE VI. *Æstivo-autumnal malarial fever; acute hemorrhagic nephritis; recovery (?)*.—No. 13,578. J. T., aged twenty-one years; admitted August 13, 1895. Family and personal history good. No history of previous illness beyond an attack of chills and fever two years ago, lasting three weeks. For three weeks has had daily chills and pain in head and abdomen.

Physical Examination. Marked pallor; no cardiac hypertrophy; no increase in pulse-tension; spleen palpable.

Blood. Æstivo-autumnal hyaline bodies and crescents.

Urine. Smoky; acid; 1012; trace of albumin. Sediment: Dark brown; flocculent; showing microscopically blood and pus cells; hyaline and granular casts with blood adherent.

There were febrile paroxysms on the 13th and 14th, disappearing immediately under quinine, which was begun on the 14th, 0.65 (gr. x), two doses, then gr. v, every four hours. The urine increased in quantity; the albumin diminished, but was still present as a trace, with occasional hyaline and granular casts and red blood-cells in the sediment, on the day of discharge. On August 19th, the patient, feeling perfectly well, left against advice.

Beyond the quinine, the patient was given iron in the form of Blaud's pills.

CASE VII. *Malarial fever; æstivo-autumnal infection; cachexia; acute nephritis; recovery*.—No. 14,527. M. J. M., female, aged twenty-nine years; admitted November 18, 1895. Family history negative. Scarlet fever with drowsy seventeen years ago; syphilis two years ago; otherwise always well and strong. Has had chills and fever, her first attack, off and on, for seven months. Frequent headaches; general debility. For three weeks moderate œdema of the face and legs.

Physical Examination. Marked anæmia (1,160,000 red corpuscles)

and cachexia. Heart: Apex just outside nipple in fifth space; soft blowing murmur all over cardiac area, lost in the axilla; no increase in pulse tension; spleen much enlarged.

Blood. *Æstivo-autumnal* parasites; hyaline bodies, crescentic and ovoid forms.

Urine. Cloudy; acid; 1006; decided trace of albumin; heavy brownish precipitate. Microscopically: Numerous pus-cells and granular casts with epithelial cells adherent.

There was irregular fever on the 18th and 19th, disappearing rapidly under quinine, 0.325 (gr. v), three times a day. The diet was restricted and Bland's pills, form. 2, ii. t. i. d., were given.

The *urine* was increased in quantity throughout and showed always a trace of albumin, with a sediment as above, excepting for the occasional presence of a few red blood-corpuscles.

The *œdema* disappeared, and on December 10th the patient left the hospital against advice, feeling greatly improved.

On January 27, 1896, patient returned, with severe nocturnal headaches of luetic origin, which disappeared in two weeks under iodide of potassium. The *anæmia* was much improved: red blood-corpuscles, 3,300,000.

Urine. Somewhat increased in quantity; still contains about .05 per cent. of albumin. The sediment showed hyaline and granular casts with occasional epithelial cells adherent.

The patient was again in the hospital in April, 1898, suffering from syphilitic periostitis. The *urine* throughout was normal; excretion of solids and urea normal; no albumin; no polyuria.

CASE VIII. *Malarial fever; obstinate quartan infection; acute nephritis; recovery* (?).—No. 16,720. R. M., aged twenty-two years, colored; admitted July 19, 1898. Family history negative. Measles and whooping-cough as a child. Lives in a malarious district. Has had chills and fever off and on for many years, more or less steadily for a year. For several months there has been frequent micturition. For four weeks, *œdema* of the feet and legs.

Physical Examination. Marked pallor; no cardiac hypertrophy; no increased pulse-tension; spleen palpable.

Blood. Triple quartan infection.

Urine. Pale yellow; neutral; 1010; albumin abundant. Sediment: Few leucocytes and red blood-corpuscles; hyaline casts.

The paroxysms, quartan in character, disappeared rapidly after quinine, 0.325 (gr. v) every four hours, which was begun on the 24th. The *œdema* rapidly diminished and had entirely disappeared on discharge, excepting for a slight puffiness about the eyes. The *urine* throughout was increased in quantity. The albumin and casts rapidly diminished, but there was still a trace of the former on discharge.

The patient left against advice on July 30th, considering himself well. Beside quinine, the only medicinal treatment was with iron in the form of Bland's pills.

CASE IX. *Malarial fever; æstivo-autumnal infection; acute hemorrhagic nephritis; recovery*.—No. 16,832. W. E., colored, male, aged forty-two years; admitted July 30, 1896. Family history negative. Measles, mumps, and whooping-cough as a child. Pneumonia twenty-four years ago. For nine days weakness, nausea, exhaustion. Syncopal attack two days ago. Ischuria. Frequent micturition.

Physical Examination. Color good; tongue coated; no cardiac hypertrophy; apex impulse in the fifth space within the nipple line. No increase in pulse-tension; spleen not palpable.

Blood. *Æstivo-autumnal* parasites; hyaline, amœboid, and ring-shaped forms.

Urine. Deep red; acid; 1030; marked trace of albumin. Sediment: Considerable; pus corpuscles and red blood-corpuscles; hyaline and granular casts; small round epithelial cells.

There were febrile paroxysms on the 30th and 31st, which disappeared immediately under quinine, 0.325 (gr. v), every four hours. The patient left the hospital, apparently well, on August 8th. There was no marked polyuria. Unfortunately no further record was made of his urine.

The patient was seen again on April 16, 1898. Has been perfectly well since discharge. Is convalescent from a mild attack of acute bronchitis.

Heart's apex in sixth space 10 cm. from the median line, about in the mammillary line. Pulse-tension not increased. Radial artery very slightly thickened.

Urine, passed at 11 A.M., high color; acid; 1026½; no albumin by nitric acid or heat. Sediment: Numerous cylindroids; small round cells; occasional red blood-corpuscles; a few hyaline casts with an occasional degenerated cell adherent.

CASE X. Malarial fever; æstivo-autumnal infection; acute hemorrhagic nephritis; recovery.—No. 16,995. A. H., male, aged thirty-five years; admitted August 13, 1896. Family history negative. Measles, scarlet fever, and smallpox in childhood. Renal colic nine years ago. Has complained for three days of severe headache, general exhaustion, and fever. Has never had malarial fever previously.

Physical Examination. Patient has high fever; is flushed; tongue coated; no cardiac hypertrophy; no increase in blood tension; spleen palpable.

Blood. *Æstivo-autumnal* parasites; hyaline amœboid bodies.

Urine. Dark; smoky; 1030; acid; trace of albumin. Sediment, slight. Microscopically: Red blood-corpuscles; granular and hyaline casts.

There was high continued fever from the 13th to the 16th, after which date the temperature was normal, following treatment with quinine, 0.325 (gr. v) every four hours, which was begun on the morning of the 14th.

The patient left on the 18th, feeling well. Unfortunately no further note was made upon the urine.

The patient has been seen on a number of occasions since that time. Has had no further attacks of malaria and believes that he is in perfectly good health.

A specimen of urine obtained in June, 1898, was quite normal.

CASE XI. Malarial fever; æstivo-autumnal infection; acute nephritis; recovery.—No. 17,000. J. P., female, colored, aged forty-four years; admitted August 13, 1896. Family history negative; measles, mumps, and whooping-cough as a child. Has had several previous attacks of chills and fever. For about two weeks has complained of vomiting, headache, and at times slight delirium; ischuria.

Physical Examination. Large woman; tongue coated; no anasarca; fine râles at bases of the lungs; slight accentuation of second aortic

sound; no apparent cardiac hypertrophy; no increased pulse tension; spleen not palpable.

Blood. *Æstivo-autumnal* parasites; amœboid hyaline bodies and crescents.

Urine. Amber; acid; 1025; albumin, 0.2 per cent. Sediment: Pus and vaginal epithelium; hyaline and granular casts.

There were febrile paroxysms on the 13th, 14th, and 15th, disappearing rapidly under quinine. The patient left the hospital on August 22d at her own request, feeling perfectly well. Unfortunately, no final note was made upon the urine.

The patient was communicated with by letter, and states on April 10, 1898, that she is perfectly well. She has, however, had chills and fever since leaving the hospital. A specimen of urine obtained in May, 1898, was absolutely normal in character.

CASE XII. *Malarial fever; æstivo-autumnal infection; nephritis; recovery.*—No. 17,071. C. S., male, aged twenty-seven years; admitted August 21, 1896. Family history negative. Has had no serious illness. The patient never suffered from malarial fever previously; he lives in a malarious district. Seven weeks ago began to suffer with swelling of the abdomen and legs, for which he took to bed. Since then the swelling has become general.

Physical Examination. Yellowish complexion; marked pallor; no cardiac hypertrophy; slight accentuation of the second aortic sound; spleen palpable; marked œdema of the legs.

Blood. *Æstivo-autumnal* parasites; numerous crescentic and ovoid forms.

Urine. Light amber; 1012; trace of albumin; numerous hyaline and granular casts with epithelium adherent; epithelial casts; yellow granular casts, suggestive of a blood-staining.

There was moderate fever on admission, rapidly disappearing under quinine, 0.325 (gr. v), every four hours, which was begun on August 23d. The patient was placed on a milk diet and given bitartrate of potassium as a diuretic.

The quantity of urine up to September 16th was above normal, averaging over 2000 c.c., the albumin diminished in quantity. Occasional blood-corpuscles were also seen in the sediment and upon the casts.

On September 16th, without apparent cause, the urine fell to 600 c.c. There were pain and swelling of the left knee-joint.

September 17th. Urine: Reddish; smoky; albumin, 0.15 per cent. Sediment: Numerous blood-corpuscles and an increased number of casts.

From this date the urine steadily improved, the quantity being throughout supranormal. The patient improved progressively; the swelling and pain in the knee rapidly disappeared.

October 21st. Urine: 3000 c.c.; pale; acid; 1010; no albumin. Sediment shows nothing abnormal. Patient discharged well.

CASE XIII. *Malarial fever; æstivo-autumnal infection; acute hemorrhagic nephritis; recovery.*—No. 17,250. M. S., female, aged ten years; admitted September 9, 1896. Family history negative. Has had measles. Lives in a malarious district, and has had chills and fever before. One week ago she began to have fever, abdominal pain, and headache. There were two chills at the onset. These were followed by swelling of the abdomen and legs.

Physical Examination. Marked pallor; general œdema; ascites; no cardiac hypertrophy; blood tension not increased; spleen palpable.

Blood. Æstivo-autumnal parasites; crescentic forms.

Urine. Smoky; acid; 1015; 0.2 per cent. albumin. Sediment: Pus, hyaline, granular, and blood casts; red blood-corpuscles.

There were febrile paroxysms on the 10th, 11th, and 12th, disappearing immediately after quinine, 0.26 (gr. iv), t. i. d., on the 13th. The patient was given a milk diet and bitartrate of potassium as a diuretic.

The œdema slowly disappeared. It was last noted on September 29th. The urine, at first reduced in quantity, soon became increased above the normal amount; the albumin diminished to a slight trace.

October 24th. Urine, pale; acid; 1012; albumin, 0.1 per cent. Sediment: Few granular and hyaline casts; several red blood-corpuscles.

25th. The patient was discharged to-day, feeling perfectly well.¹

CASE XIV. *Malarial fever; æstivo-autumnal infection; acute hemorrhagic nephritis; carbuncle; left the hospital improved.*—No. 17,266. H. J. S., aged forty-one years; admitted September 11, 1896. Family history good. Had measles as a child, and malaria seven years ago; syphilis eight years ago. The patient has had daily chills off and on for a month, the last twelve days ago; this is his first attack. Ten days ago, after exposure, œdema of the face and extremities appeared. Afterward he began to suffer with pain in the neck.

Physical Examination. Marked pallor; general œdema; ascites; no cardiac hypertrophy; carbuncle on the back of the neck; heart sounds normal; arteries slightly thickened; spleen not palpable.

Blood. Æstivo-autumnal parasites; hyaline bodies, presegmenting forms; crescentic bodies.

Urine. Dark red; acid; 1017; albumin, abundant. Sediment: Heavy, brownish; granular, epithelial, blood, and pus casts, epithelial cells; leucocytes; red blood-corpuscles.

There were slight evening elevations of temperature on the 11th, 12th, and 13th. On the 14th the patient left the hospital against advice, operation upon the carbuncle having been advised. The patient was much improved, the œdema having almost disappeared.

CASE XV.—*Vide* page 574.

CASE XVI.—*Vide* page 574.

CASE XVII.—*Vide* page 649.

CASE XVIII. *Malarial fever; double tertian infection; acute hemorrhagic nephritis; recovery.*—No. 19,288. M. S., female, aged eleven years; admitted April 27, 1897. The patient, who had suffered from a similar attack in September, 1896 (Case XIII.), had been enjoying good health since her discharge from the hospital.

Seventeen days ago she began to have tertian chills, which have continued since. There have been frequent attacks of nausea and vomiting and vertigo.

Physical Examination. Marked pallor; face puffy; heart and lungs negative; spleen palpable.

Blood. Two groups of tertian parasites.

Urine. Smoky; acid; 1015; trace of albumin. Sediment: Moderate; small epithelial cells; hyaline and granular casts, one with a considerable quantity of fat; few leucocytes; occasional red blood-cells.

¹ See Case XVIII.

Febrile paroxysms occurred on the 27th and 28th, disappearing after treatment by quinine, 0.13 (gr. ii), every four hours.

The patient improved rapidly, the smokiness disappearing soon from the urine. The œdema of the eyes rapidly subsided.

May 4, 1897. *Urine*: Pale; acid; 1012; faint trace of albumin. *Sediment*: Slight; epithelial cells; few small hyaline casts.

5th. Patient, feeling perfectly well, leaves the hospital against advice.

On May 17, 1897, the patient returned to the hospital, having had a chill two days before, after which she had taken quinine. The blood was free from parasites, and no further chills occurred; the treatment was continued.

Physical Examination was negative.

The *urine* was examined frequently during the next two weeks; it was always perfectly normal. The *urea*, estimated on one occasion, amounted to 0.028 per c.c.

On June 2, 1897, patient was discharged well.

CASE XIX. *Malarial fever; æstivo-autumnal infection; acute hemorrhagic nephritis; recovery* (?).—No. 20,421. J. P., male, aged thirty-eight years; admitted August 25, 1897. Family history good. No history of infectious disease. The patient had chills as a child and again last year. For four weeks he has suffered from chills and fever off and on. For three weeks there has been swelling of the legs and abdomen; drowsiness; ischuria; dyspnœa.

Physical Examination. Pallor; general œdema and ascites; double hydrothorax; no cardiac hypertrophy; pulse-tension rather high; spleen not palpable.

Blood. *Æstivo-autumnal* parasites; hyaline amœboid bodies; crescentic forms.

Urine. Deep amber; slightly turbid; acid; 1020; albumin abundant. *Sediment*: Flocculent; hyaline casts with epithelium, pus and blood adherent; free blood and pus.

There were febrile paroxysms on the 25th and 26th, the temperature remaining normal after the beginning of quinine, 0.325 (gr. v), three times a day, on the 27th. The œdema and ascites rapidly disappeared.

The *urine* was reduced in quantity on the 26th and 27th (880 and 560 c.c.). From this time on there was polyuria, amounting to 2200 c.c. on September 1st. The albumin steadily diminished in quantity.

September 2d. *Urine*: Normal; acid; 1015; no albumin; microscopically a few hyaline casts are still to be found in the sediment.

The patient left the hospital against advice, feeling perfectly well.

CASE XX.—*Vide* page 650.

CASE XXI.—*Vide* page 651.

CASE XXII. *Malarial fever; type* (?); *acute nephritis; recovery* (?).—L. S., male, colored, aged forty-three years. Visited the out-patient department on March 27, 1895. Family history negative. Measles and whooping-cough as a child. Had chills and fever in spring of 1894. For three weeks he has complained of cough and expectoration. For three days he has had chills and swelling of the legs; frequent micturition.

Physical Examination. Pallor; œdema of the legs; harsh breathing, with fine crackling râles at the apex of the right lung.

Blood. Malarial parasites found; type not mentioned.

Urine. Albuminous ring quite marked with HNO_3 .

Treatment. Quinine.

April 10, 1895. Feels better in every way.

CASE XXIII. *Malarial fever; tertian infection; acute nephritis; result (?)*.—K. W., female, aged seventeen years. Visited the out-patient department on July 31, 1896. Family history negative. Measles; otherwise no serious illnesses. Has had chills previously. For ten days there have been daily paroxysms.

Physical Examination. Tongue coated; nasal and labial herpes; spleen palpable.

Blood. Partially grown tertian parasites.

Treatment. Quinine.

August 14, 1896. Chills have disappeared, but a week ago noticed oedema of the feet; scantiness of urine.

The urine contains large amount of albumin, hyaline and granular casts, numerous bladder and vaginal epithelial cells.

Treatment. Milk diet; rest in bed; quinine.

The patient did not report again.

CASE XXIV. *Malarial fever; tertian infection; acute nephritis; recovery (?)*.—F. G., female, aged twenty-three years. Visited the out-patient department August 17, 1896. Family history negative. Has had no serious illnesses. The patient has never had malarial fever. For a day or so very severe headache.

Physical Examination. Marked pallor; moderate oedema of the legs.

Blood. Not examined.

Urine. Decided trace of albumin; epithelial cells; leucocytes; numerous coarsely and finely granular casts.

August 22d. Returned to-day complaining of having had three tertian chills, the last yesterday; severe headaches.

Blood. Tertian parasites; half-grown forms.

Under quinine the patient made a perfect recovery. Seen again March 17, 1897, feeling perfectly well. No further examinations of the urine were made.

CASE XXV. *Malarial fever; æstivo-autumnal infection; acute hemorrhagic nephritis; result (?)*.—J. S., aged twenty-one years. Visited the out-patient department September 28, 1896. Family history negative. Always well, excepting for measles as a child. The patient had never suffered from malaria previously. Two weeks ago two chills. Since then swelling of the face and legs came on, and he has complained of a bad taste in the mouth.

Physical Examination. General oedema; no cardiac hypertrophy; spleen palpable.

Blood. Æstivo-autumnal organisms; numerous crescents.

Urine. Smoky; bloody; contains a large quantity of albumin.

Treatment. Advised to enter hospital.

The patient did not return.

CASE XXVI. *Malarial fever; æstivo-autumnal infection; acute nephritis; arterio-sclerosis*.—J. M., aged forty years. Visited the out-patient department on October 20, 1896. Family history negative. Always strong and well. For four weeks and a half the patient has had chills off and on, his first attack. Headache, vertigo, and swelling of the feet for a week.

Physical Examination. Pallor; oedema of the legs; apex impulse

under the sixth rib in mammillary line; sounds clear; radial arteries thickened.

Blood. Æstivo-autumnal parasites; numerous crescentic bodies.

Urine has a marked amount of albumin.

The patient refused to enter the hospital and failed to report at the dispensary again.

THE RENAL FORM OF ENTERIC FEVER.¹

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THE prominence of certain symptoms in cases of enteric fever, the evidences of intense implication of special organs, and occasional modifications in the course of the attack, have given rise to various attempts to arrange the cases in categories and to describe special forms of the disease.

We find in systematic writings upon the subject descriptions more or less complete of the following forms of enteric fever: 1. The mild, or typhus levissimus. 2. The latent or ambulatory form—walking typhoid. 3. The abortive form. 4. Afebrile enteric fever. 5. The enteric fever of childhood—so-called infantile remittent fever. 6. Enteric fever in the aged. 7. Hemorrhagic typhoid, the last being a rare form, commonly fatal, characterized by hemorrhages into the skin and from mucous surfaces, and corresponding to the hemorrhagic forms of variola, measles, and other infections. These categories are similar to the groupings of cases made by common consent in the descriptions of other acute diseases, and unquestionably serve a useful purpose. When, however, we observe a disposition to set up other lines of division and to group the cases upon a different system of classification, we are impressed with the unsatisfactory results of nosological refinements. To describe bilious and sudoral forms and to speak of ataxic and adynamic types is neither scientific nor convenient; nor, for the student, does it simplify the subject to constitute distinct varieties, such as pleural, pulmonary, cerebro-spinal, and renal. Nevertheless, aberrant forms, of which these terms are descriptive, are encountered. They are too rare to constitute varieties of the disease; too common to be disregarded in systematic descriptions.

Some years ago a woman, aged about forty years, was admitted to my service in the hospital of the Jefferson Medical College, who presented the general symptoms of enteric fever with the physical signs of a croupous pneumonia. The illness began suddenly, with chill and very high temperature. The case terminated fatally. Upon autopsy

¹ Read by title at the thirteenth annual session of the Association of American Physicians held at Washington, D. C., May, 1898.

the abdominal lesions of enteric fever were found, and Eberth's bacilli were recovered from the pulmonary exudate.

The wife of a physician was taken suddenly ill with intense headache, vomiting, and painful rigidity of the muscles of the back of the neck. The heart's action was feeble and irregular. There was active febrile movement of remittent type. At the end of a week the cerebro-spinal symptoms abruptly ceased, rose-spots appeared, the spleen became enlarged, and the case ran the course of an uncomplicated enteric fever.

A Russian boy, aged four years, was admitted to the Pennsylvania Hospital on the fourth day of an illness attended with pain in the limbs and swelling and tenderness of the belly. Upon admission there was slight painful rigidity of the muscles of the back of the neck, together with spasmodic contractions of the muscles of the arms and hands. Except dilatation, there were no pupillary symptoms, no strabismus, no trismus. There was no disease of the ears. A few hours after admission the patient's temperature suddenly fell from 102° to 95° F. It rapidly rose again. The child was fretful, and preferred to lie upon his side, with his limbs strongly flexed. He cried out with pain upon being moved. Ankle-clonus was present, and the knee-jerks were increased. A small amount of albumin, with hyaline and granular casts, appeared in the urine. There were one or two herpetic vesicles upon the lips and a few pustules upon the occipital region and upon the trunk; the tongue was moist, thickly coated with a white, pasty fur; it was red at the tip and edges. Upon the third day after admission a group of typical rose-spots appeared upon the abdomen and chest, and the spleen was made out to be enlarged. About this time there was rapid amelioration of the nervous symptoms; the reflex phenomena subsided; pain on movement disappeared, and the case presented symptoms of a typical enteric fever of moderate severity in childhood. Treatment, systematic cold bathing. Convalescence was retarded by furunculosis.

The following case, recently seen in consultation with Dr. Byers and Dr. Hobson, is an example of the renal form of enteric fever—nephrotyphoid:

A lad, aged nineteen years, salesman, who had never had enteric fever and whose previous health had been excellent, began, about December 10, 1897, to complain of weakness and loss of appetite. A few days later he had headache and was feverish in the evening. It was noticed that he was unusually pale. December 24th he was obliged to abandon his work and remain in bed. About this time headache became severe.

From this time on there was continued fever, the temperature ranging from 99.3° F. as a single minimum in the morning to 105° F. as a maximum in the evening, until the fifty-fourth day, when it became normal and remained so. During the greater part of this period the temperature fluctuated between 102° and 104° F. From the time the patient was obliged to remain in bed until January 8th, namely, a period of fifteen days, the symptoms were those of an acute nephritis. The urine varied in specific gravity from 1010 to 1030 and showed large amounts of albumin, together with erythrocytes, leucocytes, epithelial cells, and granular casts. The breath was urinous, the skin hot and dry, and there were delirium and occasional vomiting, with a

slight puffiness under the eyes, but upon the most careful examination no œdema elsewhere. An examination of the eye-grounds by Dr. Hansell showed engorgement of the venous circulation, but no retinitis nor any signs of past trouble. The amount of urine was about twenty-five fluidounces in twenty-four hours.

The patient did not improve under treatment directed to this condition, including calomel and saline purging, hot-air baths, and cut cups in the lumbar region, although under this treatment the quantity of urine voided was increased to sixty ounces in twenty-four hours. He became greatly emaciated and weak. On January 8th the following note was made: General condition much improved, but the patient continues to be extremely weak. The temperature now ranges between 99° and 101° F. The amount of urine voided amounts to eighty or ninety ounces in each twenty-four hours. The albumin is greatly diminished, casts have almost entirely disappeared, one only now and then being found in the field. A few blood-corpuscles are occasionally seen. For the first time the patient on this date passed blood in the stools.

Small amounts of blood continued to be present in the discharges from the bowels for eight days. Prior to this time the case had been carefully studied from the stand-point of a possible enteric fever. Abdominal symptoms were not, however, present, rose-spots could not be found, nor enlargement of the spleen made out. An examination of the blood now, however, gave a positive reaction to the Widal test. A liquid diet consisting chiefly of milk had been administered from the beginning of the attack.

On January 26th it was noted that the urine was free from albumin, but still contained a few erythrocytes and leucocytes. The temperature had fallen to 99.3° F. From this point the temperature began steadily to rise to the former level, the patient became delirious, albumin reappeared, together with granular casts, leucocytes, and erythrocytes. On February 2d there were diarrhœa and tympany, but no spots. On the 3d a rather copious crop of the rose-spots of enteric fever appeared. From this time on until February 19th the progress of the case was that of enteric fever. Fresh crops of spots appeared, increase in the area of splenic dulness could be made out, the tendency to diarrhœa persisted. Albumin, casts, and blood-corpuscles disappeared from the urine. Finally the patient developed the intense hunger so characteristic of the early convalescence. At the time of writing, April 15th, the urine continued to be normal.

In this case the extended febrile movement covers an obscure primary attack in which the kidneys manifestly bore the brunt of the infection, and a relapse occurring without interval—so-called intercurrent relapse—in which the ordinary symptom-complex of enteric fever is present with renewed evidences of inflammation of the kidney. Such cases are extremely rare. Their recognition is, however, of great importance.

Aside from the general theoretical importance of a correct diagnosis, we must consider here certain practical points. First, while the kidneys may, as in the foregoing instance, for a time bear the brunt of the attack, the ordinary intestinal lesions may also be present, and in this

particular case the occurrence of hemorrhage was, without doubt, the evidence of deep ulceration attended with the danger of perforation. There are, then, practically two clinical dangers in these cases which render the recognition of their essential nature necessary to the welfare of the patient: first, the danger of the administration of an improper diet; and, second, that of the improper use of purgatives. The mistake of regarding a case of enteric fever of the renal form as one of acute nephritis occasions but little danger on the part of the prudent practitioner, since the regulation of the nourishment and a diet consisting largely of milk or dilute porridges would enter into the scheme of management; but there are those who are not altogether strict in regard to the diet of their cases of acute nephritis, by whom fruits, certain vegetables, or other solid food might be permitted.

The danger from an error in diagnosis is altogether greater with reference to the use of purgatives, since the administration of calomel in full doses, and salines, enters very largely into accepted plans of treatment for acute nephritis. The diagnosis is, however, as difficult as it is important, and must remain in many cases an impossible one until the disease has made some progress.

Of even greater importance is the danger of communication of the disease which attends an error in diagnosis. From the stand-point of preventive medicine the failure to recognize a case of enteric fever is attended with risks to the community enormously greater than any danger that may affect the interests of the individual patient. The final destruction of the infecting principle in the stools and urine by efficient disinfection means the arrest of the spread of the disease upon the spot so far as any particular case goes. To neglect this procedure amounts practically to a crime against the State. The differential diagnosis between enteric fever and any other disease with which it may be confounded involves from this point of view enormous responsibility.

The following case well illustrates the difficulty of diagnosis:

I saw recently in consultation with a medical friend, at about the end of the second week of her illness, an unmarried woman, aged thirty-six years, who had been taken sick gradually with headache, great weakness, fever, tendency to diarrhoea, and other evidences of enteric fever. The spleen was enlarged. There were no rose-spots. The tongue was red at the edges and tip and heavily coated with a yellowish-white fur. In the course of a routine examination the evidences of an acute nephritis had been discovered in the urine. There was slight prætibial œdema. The temperature ranged between 102° and 104° F. The general appearance of the case was that of enteric fever of mild type. At my suggestion, the agglutinating power of the blood-serum upon Eberth's bacilli was tested (Widal test). About seven weeks later I was informed by the physician in charge that the convalescence of the patient was practically assured. In addition he wrote as follows: "After you saw the case her temperature pursued a zigzag course, gradually

declining and becoming normal about the twenty-second day after the nurse arrived," about the twenty-ninth day of the attack. "There was some mild delirium, and after some days the tongue became dry and glazed. The albumin disappeared as the fever subsided, but after some days there developed a phlebitis of the left leg, after which albumin was again temporarily present in the urine. No rose-spots were discovered. The Widal test was negative. While willing to admit that the Scotch verdict of 'not proven' is applicable to this case, I still feel that it was one of typhoid infection."

In this case a repetition of the Widal test at a later period was unfortunately not made. The patient ultimately entirely recovered, with permanent disappearance of albumin.

The agglutination-test is of the utmost importance in finally settling the question of diagnosis in doubtful cases. In the form of the disease under consideration, however, its value is greatly impaired by the fact that in a certain proportion of the cases the power of arresting the motility of the typhoid bacilli and causing agglutination does not show itself until the disease has made considerable progress—not earlier in some cases than the end of the second or some period in the course of the third week.

It is of practical importance, then, to treat all doubtful cases in which for the time being the differential diagnosis between subacute or acute nephritis and enteric fever cannot be made as possible cases of enteric fever. Certainly this method of management is imperative as regards the regulation of the diet and the disinfection of the stools and urine—matters which involve no risk in any case and which recommend themselves for acceptance in doubtful cases in view of the fact that in the majority of instances in which this particular differential diagnosis is in question the sickness will ultimately prove to be enteric fever.

THE MEDICO-LEGAL ASPECTS OF HYPNOTISM.

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OF late the plea of hypnotization has frequently been used as a defence in criminal cases. This is not the only aspect, however, from which hypnotism is interesting to the student of forensic medicine. It has been used very frequently as a therapeutic agent, and it may perhaps be of greater practical importance to investigate whether its continued use is

not associated with certain dangers which in some instances at least would justify judicial interference.

The first question, then, which we will attempt to answer, will be this: Can the hypnotized be injured physically or mentally by hypnotization? If we search for an answer to this question in literature, we will find the most conflicting statements, but will be surprised to see how rapidly the number of those is increasing who raise their voices in warning against the indiscriminate use of hypnotism. We have learned to look upon hypnotism not as a physiological, but as a pathological condition, and our best and most recent works on diseases of the nervous system, such as that of Gowers, Grasset, and others, devote extensive chapters to the discussion of the *disease*, hypnotism, as they do to hysteria or any other neurosis. While most of the symptoms of this pathological state are but of short duration, there are others, appearing more particularly after prolonged and frequent use, which are permanent. This fact was recognized by a committee on hypnotism appointed by the British Medical Association, which in 1892 reported that dangers from the use of hypnotism might arise from want of knowledge, carelessness, or intentional abuse, or from *too continuous repetition of suggestions in unsuitable cases*. What these dangers are is stated in a paper by Dr. Henry Rayner,¹ written about one year later, in which he says: "The risk of mental deterioration by the frequent induction of states of incomplete consciousness, hypnotic or other, should be distinctly taught and the habit for those of neurotic diathesis labelled 'Dangerous—this way madness lies.'" This opinion is supported by numerous other writers. Thus Professor M. Benedikt, of Vienna, in his book on *Hypnotism and Suggestion*, states that hypnotic experiments have a demoralizing influence on the intellect, will-power, and psychical independence of the patient. Artificial catalepsy, he continues, resembles narcotic drugs, in giving momentary relief at the cost of subsequent injury. "We often remove a symptom by hypnosis, and thereby increase the tendency to the development of other and more serious ones."

Similar to the views held by Benedikt are those of Dr. A. B. Richardson,² who speaks of the harmful results produced by the abuse of hypnotism, and believes that there is but one class of cases in which its use *ad libitum* is justifiable, and that in persons who already possess such defective inhibition as to be in a pathological state. Binns-wanger found that long-continued use of hypnotism rendered the patient feebler in intellectual force—mentally weary. Mendel, too, is of the opinion that it is often followed by injurious after-effects, such as nervousness and even convulsions. Its use is strongly condemned both by Meynert and von Ziemssen. Norman Kerr has found the after-effects to be a mental

¹ British Medical Journal, 1893, p. 1407.

² Cincinnati Lancet-Clinic.

disturbance, a dissipation of energy, and a nerve exhaustion, a frequent repetition being apt to cause deterioration of brain-function and nerve-function, intellectual decadence, and moral perversion. Germain Sée arrived at the conclusion that hypnotism is apt to produce evil effects on the organism, and that it especially favors and develops tendencies to hysteria.

In our country Dr. Leszinsky stated in a paper read at a meeting of the New York Neurological Society, January 5, 1892, that he felt satisfied that in one of his cases hypnotism was responsible for the deterioration of the nervous tone and the development of hysterogenic zones. At the same meeting Dr. Landon Carter Gray spoke of the demoralizing influence of hypnotism. Much harm had, in his opinion, been done by hypnotizing paranoiacs.

The well-known fact that the greatest of all neurologists, Charcot, but a few years ago one of the most enthusiastic on the subject of hypnotism, had abandoned this method of treatment almost completely during the last years of his life, is known to all who have followed the literature on this subject.

We have seen, then, that in all parts of the civilized world recognized authorities have spoken and written of the dangers of hypnotism. That they were justified in so doing, the brief records of a few of the most striking cases will prove beyond all doubt. I cannot record, however briefly, the numerous cases published by Charcot, Séglas, George Guinon, and many others illustrating the tendency of hypnotism to cause an outbreak of hysteria both in children and in adults. One of Lombroso's cases, however, shall be described briefly, as it demonstrates with unusual clearness the dangers of hypnotization.

An officer who had been hypnotized at a public *séance* would from time to time have attacks of spontaneous hypnotism at the sight of any shining object. Thus the sight of a carriage-lamp was sufficient to throw him into a trance, in which he would follow the vehicle as though spell-bound. One evening this occurred, and he was going directly toward an approaching carriage and would have been crushed to death had not a comrade saved him. This experience was followed by a violent hysterical crisis.

An instance in which the outcome was even more serious is reported in the *British Medical Journal*, of 1893, p. 130, as follows:

"A woman who had attained a certain local notoriety in Vienna as a spiritualist and faith-curer has for some time past had under her care a young man of twenty-five years, who suffered from epilepsy. According to particulars now forthcoming, this person promised her patient and his parents that she would complete the cure at a *séance* of a spiritualistic society of which she was a member, and where, for this purpose, she intended to employ the young man as a medium. All that the patient

can remember of this *séance* was that at the beginning the usual 'magnetic circle' was formed by those present. He was apparently put into hypnotic sleep from which he was aroused at half-past nine o'clock and told that he could go home. He had only taken a few steps after leaving the tramcar near his own home when he fell senseless into a heap of snow by the roadside. In this condition he was taken to his home, where he remained unconscious for a long time. On recovering he spoke so wildly and incoherently that a doctor was summoned, who declared him to be suffering from a religious mania. He was accordingly removed to a hospital."

F. Jolly¹ reports cases in which the form and contents of illusions of insane patients were influenced by hypnotization. Another one of his patients, a member of a healthy family, who had himself never shown any symptoms of hysteria, but suffered from muscular dystrophy, was hypnotized, and very shortly after the first *séance* became the victim of hysterical seizures. Jolly states that he is unable to detect any difference between those "habitually hypnotized" and the hysterical.

To these few characteristic cases taken from literature I can add the following from my own personal knowledge: A boy, hitherto perfectly healthy, was used for experiments in hypnotism. After some time he became a sufferer from chronic headache. A woman, who suffered from hysterical mutism, had frequently found relief from this symptom for a short time by being hypnotized. One of the *séances*, which I had occasion to witness, had the usual effect upon the lost speech, but in addition to that the patient woke with paralysis of the right arm, not permanent, but certainly annoying enough while it lasted. A young woman, a student of medicine, had been treated by a few of the most celebrated European alienists for melancholia without appreciable benefit to the patient. At her own request she was hypnotized. While in the hypnotic state she had a typical and violent hysterical seizure, the first one in her life, but not the last one, for they frequently recurred in the waking state. Her melancholia remained entirely unchanged. But even more serious results than those just described have occurred in some instances. But very recently Dr. F. Winslow² described a case in which the life of the victim appears to have been in the greatest danger but for the timely interference of Dr. Winslow. He speaks of a man who for some hours had been in an hypnotic trance. When Dr. Winslow examined the "medium" he found that he was threatened with failure of the heart, the beating of which was barely perceptible, while the temperature had gone down from 97.2° to 95.4° F. The face was markedly cyanotic. Upon examining the man after the experiment was

¹ Ueber Hypnotismus und Geistesstörung, Arch. f. Psych., Bd. xxv. p. 600.

² Lancet, February 9, 1895.

over he was found to have a weak and dilated heart and swelling of the ankles.

Finally, I wish to report briefly those cases in which death did occur during or after hypnosis. And in order to prove from the very beginning that such accidents are not always due to ignorance or carelessness, my first case shall be one reported by him who of all living men has probably had the largest experience with hypnotism—Bernheim. In the *Revue Médicale de l'Est*, of February 1, 1895, he publishes the following case: A patient, thirty-seven years of age, who suffered from inflammation of the veins of the leg, was hypnotized in order to relieve the pain in the affected limb. He was brought under influence without difficulty, but almost immediately he was seized with a feeling of oppression in the chest and difficult breathing, and he died in two hours, declaring that hypnotism had killed him. The post-mortem examination showed that death was due to embolism of the pulmonary artery, and it is more than probable that this was due to the excitement induced by the hypnotizing process.

In the *American Medical Journal*, of 1888, I find a brief notice referring to the case of a lady who was hypnotized by her husband, a physician, to relieve pain during the extraction of a tooth. He made a few movements before her face; she screamed and fell dead. It is stated that the patient did not suffer from heart disease. My attempts to obtain more detailed information about this important case have failed.

The most interesting of all fatal cases of hypnotism is that of Fräulein Ella von Salmon, which attracted such marked attention the world over some years ago. An anæmic and hysterical young woman had been hypnotized repeatedly. One evening this was to be attempted again, but before she was brought under influence she suddenly became very much excited and died. The case was investigated thoroughly by the Austrian authorities, and a post-mortem examination was held, which showed no other pathological condition but that of anæmia. The conclusion reached by the physicians who had examined the body was that Miss Salmon had fallen a victim to unwholesome excitement.

Finally, I can add to these cases, which I have gathered from what little literature on the subject was at my disposal, another unpublished one which in many respects resembles Lombroso's case, excepting that in this instance the termination was a more tragic one. The patient, a young woman, had been under the care of one of the best-known European alienists, a man who has done quite a little work on the subject of hypnotism, and may well be considered to be one of the authorities on this subject. He had hypnotized the patient a number of times by the sounding of a gong. In course of time any regular and monotonous noise would suffice to produce a trance in her. One day at high noon

she was crossing a very frequented square in her native city, when the bells of a neighboring church began to ring. She promptly became hypnotized, staggered along, and before anybody could interfere had run under the wheels of a vehicle. When picked up she was dead.

We have seen, then, that hypnotism is now generally conceded to be a pathological and not a physiological condition. We have seen that its use, particularly when resorted to too frequently, is liable to bring on mental deterioration; we have seen that it may be the cause of chronic headache, of an outbreak of hysteria—a very common occurrence; that at times it has an undesirable effect upon pre-existing mental disease, and that in rare instances it may even produce an outbreak of insanity. Furthermore, we have just learned that there are a few cases on record in which hypnotism was directly or indirectly responsible for the death of the patient. On the other hand, we all know that hypnotism is a useful therapeutic agent practically only in cases of functional disease which but very rarely endangers the patient's life.

The question must arise, Is the physician justified in using a remedy that presents so many dangers in the treatment of diseases which are generally so little dangerous to life as are hysteria and neurasthenia? Is not here the remedy worse than the disease, and above all, have we not simpler, better, less dangerous methods of treating these maladies? After having studied the question of hypnotism as a therapeutic agent some years ago, I experimented with the view of ascertaining whether or not suggestion in the waking state was not equally efficient. A large series of cases convinced me that a hypodermic injection of aqua destillata, if it be given under the proper precautions and circumstances, so as to impress the patient deeply, will produce very nearly, if not quite, as many brilliant cures as hypnotism. In these cases of functional disease it is not so much a question of what remedy you use as it is a question of how you apply it. I am of the opinion, then, that hypnotism should be used as a therapeutic agent only when other methods of treatment and suggestion have failed. It seems to me that its dangers are not sufficiently well known even among physicians, and that consequently its use is not restricted as it ought to be. The physician who uses it injudiciously, without due care and in cases in which other methods of treatment have not yet been tried, or who uses it in the treatment of slight and unimportant symptoms, may well be in danger of criminal prosecution. That public exhibitions, private *séances*, the use of hypnotization by the untrained and unskilled should be prohibited, has been repeated so often that it hardly need be mentioned here.

The next question which I shall attempt to answer is this: Can the hypnotized fall victims to crime? Th. Ribot,¹ in discussing hypnotism,

¹ "The Diseases of the Will," translated by Merwin-Marie Snell.

states that "in the form called lethargic there is an absolute annihilation of the will, the conscious personality being reduced to one single and unique state, which is neither chosen nor repudiated, but undergone, imposed." In another part of this same work, however, Ribot is forced to acknowledge that "there exists something which resembles a power of inhibition, though it ordinarily yields to repeated attacks." Upon the whole, he concludes, "the state of natural or provoked somnambulism may justly be regarded as an abolition of the will." Luys holds similar views on this question. He says: "The individual in these novel conditions no longer belongs to himself; he is surrendered, an inert being, to the enterprise of those who surround him. At one moment in the passive stage in this condition of lethargy or catalepsy he is absolutely defenceless and exposed to any criminal attempt of those who surround him. He can be poisoned and mutilated. When a woman is concerned, she may be violated and even infected with syphilis, of which I have recently observed a painful example in my practice. She may become a mother without any trace existing of the criminal assault and without the patient having the smallest recollection of what has passed after she has awakened."¹

These views are largely, if not exclusively, based upon the laboratory experiment which has been resorted to in numerous instances by Bernheim, Liegeois, Liebault, Beaunis, and many others, and seems to show that the hypnotized is a most ready victim to all sorts of crimes, that he may be induced to sign all kinds of documents, that he may be induced to accuse himself of being guilty of crimes which in reality were never committed, etc.

Some years ago the French Government appointed a committee, of which Brouardel was perhaps the most prominent member, to investigate experimentally the following questions:

1. Can a person cause another, when in a state of hypnotism, to sign receipts for money not received?
2. Can a person, hypnotized, be forced against his or her will to execute a will in favor of any individual?

Both questions were answered in the affirmative by the committee, these answers being based, of course, upon the results of laboratory experiments. Theoretically, then, and according to the laboratory experiments, the hypnotized is absolutely at the mercy of those who wish to use him for criminal purposes. If we look around for actual proofs, for cases in which the hypnotized were made victims of crimes *outside* of the laboratory, we will find but very little to support these views. In the literature at my disposal there is not a single record of a case of this kind, with the exception of two instances in which rape was supposed to

¹ Leçons cliniques sur les principaux Phénomènes de l'Hypnotisme, etc., Paris, 1890.

have been committed on hypnotized women, and one case in which a wealthy woman was induced by hypnotization to enter into marriage. Both of the former cases are quite old and date from a time at which comparatively little was known about hypnotism, and consequently cannot be considered as valuable as more recent cases would be. The other case is that of a tramp who in 1865 was accused of having hypnotized and violated a woman repeatedly. He was tried in the court at Draguignan, and, upon the testimony of five physicians who were unanimous in their opinion, was found guilty of the crime charged and sentenced to a long term of imprisonment at hard labor. A second case of that kind was reported by Brouardel¹ in 1879, the accused being a dentist who violated a girl of twenty years after having brought her under influence. A point which detracts materially from the value of this case as a proof that such an act is possible is the very peculiar and suspicious statement that the crime was supposed to have been committed in the presence of the victim's own mother, and we can but agree with Hofmann, who, in quoting Brouardel, calls this "einen in vielen Beziehungen hoechst merkwuerdigen Fall" (a case which in many respects is most remarkable).²

In December, 1894, a certain Czynsky was tried in Munich for having had sexual intercourse with a woman while she was in a state "which rendered her unable to exert her will, or unconscious." The accused, a professional hypnotiseur and blackleg, had studied hypnotism under Luys. His victim, a Baroness v. Z., was a spinster, aged thirty-eight years, wealthy, weak-minded, and highly superstitious. The fact that she wore a ring given to her by Czynsky and supposed to possess magic powers is characteristic of her mental weakness and suggestibility. Both in the waking and in a "hypnoid" state her seducer suggested to her not only that he loved her, but also that she was in love with him. Although she claimed that she never loved him, she was induced to marry him. A wine merchant, disguised in the garb of a priest, performed the ceremony. Neither the State's attorney nor the experts called (Preyer, Grashey, Hirt, V. Schrenck-Notzing) assumed a total annihilation of the will-power, but rather an artificially produced diminution of the same. The accused was sentenced to three years' imprisonment.³

There is something striking in this scarcity of forensic cases. Do not the results of laboratory experiments seem to show that there could be no more convenient and no safer method of obtaining signatures to valuable documents than by hypnotizing a person? And still I have not

¹ Ann. d. Hyg. Publ., p. 39.

² E. R. v. Hofmann: Lehrbuch d. gerichtl' Medicin, 5 Auflage, 1891, p. 157.

³ W. Preyer: "Bemerkungen zum Process Czynsky," in Muenchen. Deutsche med. Wochenschrift, 1895, No. 2, S. 31.

been able to find the record of one single case in which this was done outside the laboratory. There must be some reason why so handy a method is never resorted to, and I hope to be able to demonstrate what this reason is presently. In order to avoid repetitions, however, I shall first take up our third problem, namely this: Can the hypnotized be used as a tool in the service of crime? If we attempt to solve it in the laboratory we again obtain an affirmative reply to our question. Without the least difficulty the hypnotized can be induced to fire an unloaded pistol at his dearest friend, to pour an innocuous white powder, supposed to contain arsenic, into the drinking water of a relative, to commit perjury or to bear false witness. It has always been claimed by the school at Paris that if the pistol had been loaded, that if the powder had really contained arsenic, in place of sugar or bicarbonate of sodium, these experiments would have been less successful. If the hypnotized retained any trace of reasoning power during the experiment, then this must have told him that Professor Bernheim and his pupils could not possibly have dared to run the risk of causing a murder to be committed. To this argument the school of Nancy replied very fittingly: "Why, then, if you are so firmly convinced that we are wrong, do you not give the hypnotized a loaded pistol and order him to fire it at you?" and Paris answers: "Not as long as you of Nancy are as jealous of us as you are now." It has not been an idle war of words, however. He who hypnotizes frequently will often see the hypnotized obey all orders until one is given which is particularly distasteful to him. Ch. Richet published the following rather amusing example: One of his subjects, who allowed himself without any difficulty to be metamorphosed into an officer, a sailor, etc., refused on the contrary, with tears in his eyes, to be changed into a priest; which the character and habits of the subject and the environment in which he had lived sufficiently explained.

At a meeting of the Société d'Hypnologie, Dr. De Young reported the following case: A young woman was hypnotized and the suggestion given that she pour the contents of an inkstand over her elegant light dress. She was evidently influenced by the suggestion, fought hard, but finally overcame the impulse. The same author offered a gold coin to a hypnotized Jewess on a Saturday, and the teaching of her creed had so powerful an influence over her that she refused the tempting offer.

Similar instances have been recorded by Brouardel and Gilles de la Tourette, and are of rather frequent occurrence with all who hypnotize much. All of these experiments cannot compare in value for our purpose with the one made by Dr. J. R. Cocke, of Boston,¹ very recently. Standing in front of a very deeply hypnotized subject, he placed a card in her hands, telling her it was a dagger and commanded her to stab him. The command was instantly obeyed with the greatest alacrity.

¹ Journal of the American Medical Association, 1895, p. 251.

He then handed her an open pocket-knife and again commanded her to stab him. She raised her hand as if to execute the command, but hesitated and immediately had an hysterical attack which put an end to the experiment.

Under these circumstances you will not be surprised to hear that but very few instances are recorded in which it appeared as though crimes had actually been committed by the hypnotized. The one is that of Ilma S., the heroine of v. Krafft-Ebing's famous experimental study. She was arrested for theft, claimed to have acted under the influence of hypnotism, was referred to Krafft-Ebing for examination, and acquitted upon his expert testimony. Later on it was found that she was a professional shoplifter and a prostitute and she had to acknowledge that the Professor had been deceived by her. This leaves but one other case, the one which Voisin¹ reports. He tells us about a woman who had accomplished numerous thefts at a large store in a state of automatism and under suggestion which had been imposed upon her when hypnotized. Dr. Voisin claims that he demonstrated the complete irresponsibility of this woman, who was left at liberty, while the three actual authors of the crime were punished. So we have found but one single case on record in which it is at least probable that a crime had been committed by a person while under the influence of hypnotic suggestion outside of the laboratory. I intentionally omit the three American cases on record because they lack all scientific proof.

And now let us return to the question, Why is it that hypnotism is used so very rarely for criminal purposes? Nobody would or could attempt to utilize it for such purposes who was not fairly well acquainted with its phenomena, and such a person would necessarily know of the existence of certain difficulties and dangers which we shall presently attempt to describe. First, not every person can be hypnotized, even when willing to submit. The number of those who cannot is small, we will acknowledge, if the hypnotizer has but the necessary experience and self-confidence. Very often, however, it takes a number of sittings to produce even the lighter degrees of hypnotic sleep, and in many individuals nothing beyond this can ever be obtained, thus rendering them unfit for any criminal purposes; for in this stage the danger that the hypnotized may awaken at any moment is too great to permit of such a risk as that of a criminal suggestion. We see, then, that the number of those who are fit subjects for criminal suggestion is not very large. This difficulty being overcome, we encounter a second and not less serious one. We have learned from experiments mentioned above that not all suggestions are acceptable to the hypnotized, but that those which are particularly distasteful to him, foreign to his habits and his character, are often rejected. Therefore, it would appear

¹ British Medical Journal, 1893, p. 362.

quite probable that only a person with pre-existing criminal tendencies could be used as a tool, and such a person would be influenced by many much simpler and less dangerous methods of suggestion than those of hypnotism. At any rate we have seen that there is, at least in the majority of cases, no blind, absolute obedience, that there are limits to the power of the hypnotic suggestion, which vary greatly not only in different individuals but also in the same person at different times, thus introducing another unknown and uncontrolled factor. Then again, we know that the hypnotized may awaken at any moment during the proceedings, and that this is particularly liable to occur when his suspicion is aroused by anything that is going on around him or if an inconvenient suggestion be given, just before the time arrives at which the suggestion is to be executed. Furthermore, we must not forget that a complete loss of memory for what has been going on during hypnosis is not by any means a rule lacking exceptions. There is surely not one among you who has ever witnessed or conducted experiments in hypnotism and has not seen some individual who regained consciousness with a fairly accurate knowledge of what had taken place during hypnosis.

Finally, after all of these difficulties have been overcome, and the proper suggestion has been given and accepted, the way in which the criminal act would be executed would usually immediately suggest the existence of an hypnotic influence. It would be an automaton that commits the crime, unconscious of antecedent and surrounding circumstances, uninfluenced by the presence of witnesses or any unforeseen event, going about its work as unconcernedly as though attending to the most ordinary routine duties. The tool being—supposedly—devoid of all reasoning power in this state, it would be necessary to give such suggestions as would cover all possible contingencies that might arise during the commission of the crime, otherwise the deed would necessarily be done in a clumsy and impulsive manner.

These are, in my opinion, the principal reasons why hypnotism is so rarely used by the criminal classes. That suggestion in the waking state plays a very important part in the causation of crime was probably known long before the story of Adam and Eve was written, and that such suggestions were not then considered a sufficient defence is shown by the fact that Adam was made to suffer punishment for having accepted the suggestion.

We have seen, then, that in the laboratory it is very easy to cause pseudo-criminal acts to be committed by the hypnotized; that when the suggestions are changed, so as to involve an injury either to the subject or some other person, the hypnotic suggestion fails to be effective; that there are but two well authenticated cases on record in which the plea of hypnotization was used successfully in the defence of a criminal, and that in one of these instances at least it is proved that the acquittal was

undeserved. The difficulties in producing the proper conditions for hypnotic suggestion and the danger to the hypnotizer of being detected are so great that a less practical method of committing a criminal deed could hardly be selected. We cannot but agree with the statement of Bernhard Sachs in A. McLane Hamilton's *System of Legal Medicine*, that for the present hypnotism is of greater theoretical than practical importance, both from a medical and forensic point of view.

The question as to the responsibility of the hypnotized, it appears to me, has already been answered in the foregoing as well as it can be with our present knowledge. If we acknowledge the possibility that a person may be caused to commit a crime by hypnotization, then such a person must be considered irresponsible for his actions, for hypnotism is a pathological state in which the will power of the subject is affected to a greater or lesser extent. If this paralysis of the will reaches such a degree as to overcome the natural and inborn resistance of a normal and moral person to crime, then such a person could no more be held responsible than any other mentally deranged individual who commits some impulsive criminal act. Whether the power of inhibition is ever totally destroyed in the hypnotized is something to which there can be no positive answer to-day. Experiment has demonstrated that such is but rarely the case; at any rate the evidence is overwhelmingly in favor of the view that hypnotism is of practically no use in the commission of crime.

In conclusion, I would say that in my opinion the dangers of hypnotism lie much more in its use for experimental and therapeutical than for criminal purposes.

SOME NERVOUS AND MENTAL MANIFESTATIONS OCCURRING IN CONNECTION WITH NASAL DISEASE.

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WHEN it is considered that into the most ancient times can be traced a belief in the existence of an intimate relationship between the organs of olfaction and of the understanding, and it is further remembered that modern observation has confirmed the reality of this connection, and shown by anatomical and physiological investigation that it is founded upon a rational and scientific basis, we think it is a matter for surprise that so little is to be seen on this point in the literature of the day, teeming as it is with allied subjects in the domain of rhinology.

This, too, notwithstanding that when once our attention has been called to them, instances of the dependence of mental disturbance upon pathological alterations in the nose will be found to be not only comparatively frequent, but at the same time easily capable of demonstration.

Over one hundred and fifty years ago John Jacob Wepfer,¹ in his treatise on affections of the head, made certain observations of symptoms due to nasal obstruction that are remarkable for their correctness, as is proved by quite recent studies. He tells us, for example, that among the consequences of nasal obstruction we are to count violent headache, pains in the eye, with disturbances of vision, tremor, and *debility of memory*. Though some other authors also chanced upon cases which demonstrated a relation between diseases of the nose and the intellectual functions, it was not until the valuable anatomical investigations of Axel Key and Retzius as to the connection between the lymph vessels of the brain and of the nasal mucous membrane were made known that the subject obtained notice and came to be intelligently studied.

In 1872, but one year after the report by Voltolini of a case of asthma cured by the removal of a nasal polyp, and sixteen years antedating the presentation by Guye of his cases of so-called aprosexia before the Society of German Naturalists and Physicians, Rupprecht² recorded the observation that nasal obstruction operated sometimes to bring about an incapacity for mental exertion.

Meyer, of Copenhagen, in the year following, discovered in the course of his studies on adenoid growths that the same were occasionally associated with psychological manifestations. Michel,³ in his text-book, published in 1876, mentions that a weak memory may be found in children suffering from naso-pharyngeal disease. In the light of these sparse observations, added to his own experience, Hack in 1882 very wisely suggested that nasal affections might be profitably studied from a psychiatric stand-point.

This was done by Prof. Guye, of Amsterdam, who, by his studies in the matter of the effect of nasal obstruction on the mental development of children, has placed the profession under great obligation. Although it is true that Bresgen⁴ can show that as far back as 1884 he called attention to the fact that those school-children who suffered from obstructed nasal breathing got on poorly in their school-work, to Guye we must give the credit of having made comprehensive studies and deductions along these lines. He invented, to apply to this condition, the term aprosexia, which signifies an inability to concentrate

¹ Observationes medico-practicæ de affectibus capitis internis et externis, 1723.

² Wien. med. Wochenschr., 1872, No. 68, p. 509.

³ Krankheiten der Nasenhöhle und der Nasenrachens, p. 52.

⁴ Vide letter reproduced in Deutsche med. Wochenschr., 1889, No. 9, p. 181.

the attention. He has pictured very strikingly in his writings¹ the afflictions of the young aprosexic subject; his desperate, yet unsuccessful efforts to get on at school and escape the verdict of being "dumb," his poor memory, the absolute inability to apply himself mentally, his want of concentrative power—all of which is almost invariably joined to more or less severe headaches and intolerance of alcoholic beverages. Incited by these researches, other investigators soon followed, the result of whose work went to confirm the conclusions of Guye. Walle² thought that a distinction might be made between the aprosexia of children and that of adults. In the latter, according to him, it is a mere reflex manifestation, the obstruction being generally insignificant, while in the former it is due to the interference with respiration and the consequent alteration in the constituency of the blood.

Brügelman³ has devoted especial attention to the vertigo (*Nasenschwindel*) occurring in aprosexic patients. He finds it to be common as well as characteristic, and would have it added to the three cardinal symptoms of Guye—viz, headache, want of concentration, and alcoholophobia.

A report of forty cases was soon published by Scheinman,⁴ and further studies were made by Braun,⁵ Raulin,⁶ Mainzer,⁷ and others.

Although few in numbers, the literature is not without examples of forms of psychological disorder other than aprosexia, dependent upon disease of the nose. Moritz Schmidt,⁸ in his text-book on *Diseases of the Upper Air-passages*, refers to a case reported by Lange of an idiotic boy, the inmate of an asylum, who was restored to his normal intelligence after the removal of adenoids, and also to the observation of Meyer, that this operation produced so great a change in the disposition that marriage has been thereby brought about, and Schmidt adds, moreover, that he has had experience similar to Meyer's.

Hill,⁹ who undertook the examination of idiot and imbecile children of an asylum, with reference to nasal disease, found that nearly all were mouth-breathers by reason of the presence of some obstructive lesion located in the nose or naso-pharynx.

There have been reported some interesting cases of mental aberration, of a pronounced character, apparently due to an existing disease of the nose.

Porcher¹⁰ has related a case of a man, who, along with other symp-

¹ Deutsche med. Wochenschr., 1888, No. 4; Brit. Med. Journ., 1889, vol. li. p. 790.

² Monatschrift für Ohrenheilk., 1888, No. 12.

³ Therap. Monatschr., Berlin, 1889, vol. iii. p. 67.

⁴ Berl. klin. Wochenschr., 1889, No. 14, pp. 329-401.

⁵ Wien. med. Wochenschr., 1889, vol. ii. p. 887.

⁶ Revue de Laryngol. et de Rhinol., 1890, No. 22.

⁷ Inaug. Dissert., Würzburg, 1891.

⁸ Die Krankheiten der Oberen Luftwege, Berlin, 1894, p. 221.

⁹ British Medical Journal, vol. ii. p. 711.

¹⁰ Journal of the American Medical Association, April 19, 1890, p. 575.

toms, had decided melancholic tendencies, and who had not been capable of attending to any business for more than a year. On the removal of an ecchondrosis of the septum he was completely restored to his normal mental state. Dr. J. E. Carpenter¹ has contributed an article on mental aberration attending hypertrophic rhinitis. In this affection there occurs, according to him, impairment of the faculties of the will, intellect, emotion, and memory, and among the symptoms (of which he has enumerated a great number that ought not to be so classed) he includes irritability, anger, insomnia, frightful dreams, suicidal tendencies, and inclination to suspect the sincerity of the truest friends.

In looking through the histories of reported cases we find none so constant as the melancholic feature.

Jansen² has had cases which resemble closely those of Carpenter. He mentions one patient who had what he called emotional melancholia, and another who was irritable, had a bad memory, was inclined to mistrust his sincerest friends, and had suicidal tendencies. Both recovered after the relief of the hypertrophic rhinitis.

Here and there we have been able to discover mention of mental symptoms in cases that have been published with reference to other effects of nasal disease. For example, F. H. Potter,³ in a report of cases of neurasthenia attending nasal disease, has mentioned, in addition to the symptoms of restlessness, insomnia, neuralgia, and headache, that the patient was despondent; and Foster,⁴ in a contribution upon the same subject, mentions one patient who "was unhappy and despondent and had a bad memory."

Though Dr. Wilhelm Fleiss⁵ has, under the title of the "Nasal Neuroses," reported one hundred and thirty cases and added very materially to our knowledge of the symptoms due to disease of the nose, he has recorded very few psychopathic manifestations. He has some cases of aprosexia, and has reproduced an account of one case, written by the patient himself, wherein are related very exactly all the characteristic symptoms, the incapacity for sustained mental effort, the lack of concentrative power, the loss of memory, vertigo, headache, and intolerance of alcohol. Incidentally we find it recorded in one case (No. 54) that the patient was of a despondent temperament.

Maximilian Bresgen,⁶ in his valuable monograph on headaches due to nose and throat affections, has included a case (No. 18) in which are recorded pronounced disturbances of the emotion, will, and intellect.

¹ Ibid., 1892, vol. xix. p. 539.

² Chicago Medical Record, 1892, vol. iii. p. 858.

³ Buffalo Medical and Surgical Journal, 1890-91, vol. xxx. p. 337.

⁴ St. Joseph Medical Herald, 1890, vol. ix. p. 517.

⁵ Neue Beiträge zur Klinik und Therapie der Nasalen Reflex Neurose, Leipzig und Wien, 1893.

⁶ Der Kopfschmerz bei Nasen und Rachen Leiden und seine Heilung, Leipzig, 1894.

This case is to be considered of especial value as evidence, because of the fact that the author, who was studying nasal affections only in reference to the headaches, had no idea, as he himself says, that the psychopathic manifestations were dependent upon the nasal disease, and was as much surprised as the patient's friends at their disappearance as a result of the treatment.

The patient is described as a weak-minded, weak-willed woman who had suffered from youth with the severest headaches, attended with pain about the eye.

When she came under observation she could not sit still for a moment, seemed timid, and could not look one in the face. In three months from the beginning of treatment, when nasal respiration had been fully restored, the patient was not only relieved of her headaches, but was greatly improved in her mental and also her physical condition. She now enjoyed refreshing sleep, lost her miserable look, her memory became better, and her disposition more cheerful.

Prof. A. Pick, of Prague,¹ saw a case of suddenly developed melancholia that he believed to be connected with the existing hypertrophy of the posterior turbinates, although treatment effected but temporary improvement. It was a woman, aged twenty-three years, who had suicidal and homicidal tendencies and delusions of an evil spirit residing in the nose.

Bosworth, at a meeting of the American Laryngological Society at Rochester, June, 1894, told of a case of melancholia, with aprosexia, of four years' standing, that was restored to health by a nasal operation. The case was interesting because of the numerous surgical measures that had been resorted to previously without effect.

This patient had undergone an operation for varicocele, for stricture, for hemorrhoids; had suffered castration, had had tendon of eye-muscle cut; eye enucleated, pudic artery ligated, spine cauterized, seton applied to his neck, and had been subject to circumcision.

These are all the references² which I have been able to find in the literature as to the occurrence of mental symptoms as the result of nasal disease.

Instances too numerous to recount have been reported of various nervous manifestations found associated with pathological changes in the nose. Such are hypochondriasis, neurasthenia, migraine, chorea,

¹ Reference in *Rev. de Laryng. et de Rhinol.*, Paris, 1894, vol. xiv. p. 320.

² Since writing this article I have seen that a recent number of the *Laryngoscope* (September, 1897, No. 3) contains a contribution by Zien, of Dantzic, entitled "The Relation of Nasal to Mental Disease." His remarks are based upon a personal experience, having himself developed such marked evidence of mental aberration that he had even to be confined for a while in an asylum, shortly after an accident occurring in the course of operation upon the nose. He had suppurative disease of Highmore's cavity, and the mental disturbance was probably in this case a meningitis, the result of septic absorption. Such cases have been studied by Stoerk and others.

epilepsy, spasm of the glottis, of the œsophagus, and of the eye or facial muscles, Graves' disease, insomnia, nightmare, eneuresis, and palpitation of the heart.

Some cases of genuine epilepsy of nasal origin occur in the literature. Two were reported by M. E. Ten Seethoff,¹ of some years' standing, and yet evidently cured; and one by Adenot,² who accomplished at least a decided diminution of the attacks by the removal of a large obstructing osseous tumor from the nose.

Guillaume³ has described a very interesting case of cerebellar reflex that was evidently due to the presence of adenoid growth in the nasopharynx. It was a child, aged thirteen years, who several years before had begun to have severe headaches whenever he tried to read or do other mental work. First the letters seemed to dance before the eyes, then followed cephalalgia and vertigo. The vertigo was such that the child could not, unaided, remain standing. If he tried to walk he reeled like a drunken person. While medical treatment had been of no benefit, the child recovered promptly on the removal of the adenoids.

But in the cases mentioned, as in others that have been reported wherein a connection is inferred between nasal disease and the symptoms, a clear distinction has not been made between the reflex phenomena and the effects of the nasal stenosis. Where such a discrimination has been attempted, it can be said that it was wrong as often as right, and generally symptoms that can be well enough explained by the obstruction *per se* have been grouped under the nasal reflexes, though more seldom true reflex neuroses have been considered as effects of the stenosis.

Thus, we find Fleiss,⁴ who has collected no less than one hundred and thirty cases illustrative of the effect of nasal disease upon other parts of the body, not scrupling to reckon the whole lot of them as simple reflexes, even when they were of long standing and continuous and totally devoid of paroxysmal character, and easily explained on the theory of a hinderance to the nasal respiration.

Holding, as the writer does, that the nasal neuroses and the effects of nasal obstruction *per se* can and should be kept separate, let us see if we cannot establish certain criteria which will assist in making the required differentiation. A number of points have to be considered as to the symptom in question.

1. *Association: The lesion in the nose with which it is associated, and also the accompanying symptoms.* It is not sufficient that a symptom of nasal origin be associated with an obstructive lesion of the nose to warrant us in concluding that it is the effect of the obstruction. A great

¹ Reference in Rev. de Laryng. et de Rhinol., Paris, 1894, vol. xiv. p. 439.

² Lyon Méd., April 18, 1895.

³ Union Méd. du Nord-est, 1894, xviii.

⁴ Loc. cit.

difficulty arises from the fact that some degree of stenosis is found in nearly all pathological conditions in the nose, including those that give rise to the reflex phenomena. But some conclusion may be formed if we never see this symptom in cases except where there is marked stenosis. Fortunately, not all cases of reflex will be complicated with stenosis, and this circumstance alone is sufficient to refute those authors who think the nasal neuroses are to be explained simply on the theory of nasal obstruction. It is, indeed, an old observation that the severest forms of asthma would be found associated with the smallest sized polyps, and we are aware besides that some reflex symptoms have been reported (Ruault, Schmalz) in connection with atrophic rhinitis with nasal fossæ abnormally patent. When, then, a symptom is once found unassociated with obstruction for the case in hand, it must be, of course, if of nasal origin at all, a reflex symptom, and we infer in another case that it is reflex, even though in a patient having stenosis.

The coexistence of other manifestations known to be reflex, or to be the consequences of nasal obstruction, becomes of great importance in reaching a conclusion. Thus, the reflex theory is probable if we have a coryza vasomotoria, sneezing, and serous discharge, etc.; whereas, the evidence is in favor of a symptom being due to the hindered respiration when we have before us marked anæmia and malnutrition, the consequence of defective oxidation of the blood.

2. *The disappearance of the symptom after treatment.* We try to note whether this corresponds with the removal of an irritation, or is coincident with the establishment of free respiration. We encounter here a difficulty similar to that mentioned under association; that is to say, in overcoming an obstructive lesion we almost invariably overcome a source of irritation or destroy a hyperæsthetic area, and in removing the latter we to some extent at least reduce the stenosis.

But neither one nor the other must follow of necessity in every case, and it is just by careful observation in this particular, by so operating as to remove the one condition without encroaching upon the other, that I have frequently been enabled to satisfy myself to which class a certain symptom properly belonged.

3. *The character of the symptom, and whether best explained on the hypothesis of a reflex or stenosis.* Reflex symptoms are generally paroxysmal, recurring, and having an exciting cause. Those due to stenosis must naturally be of a more chronic kind, slowly developing, continuous, and permanent.

A due consideration of all the evils that can flow from obstructed nasal breathing ought certainly, it seems to me, to restrain us from the sweeping generalizations that are made by Fleiss and others as to the reflex causation-theory. Since we are dealing especially with psychopathic phenomena, how, we may inquire, can an obstructive lesion of

the nose interfere with the cerebral functions? Briefly, by (a) alteration and impoverishment of the general, and secondarily of the cerebral circulation, from the overcharging of the blood with CO_2 and the diminished supply of O, which are the necessary results of deficient aëration; (b) interference with the blood-supply of the brain by the lesion in the nose; (c) hinderance to the outflow of lymph from the brain. It has been shown that the subdural and subarachnoid lymph spaces are in direct connection with the lymph vessels of nasal mucous membrane. Guye held that aprosexia was owing to the interference with the lymph circulation, by reason of which the products of cerebral tissue metabolism are accumulated in the brain, producing brain fatigue or the so-called "retentions exhaustion." (d) It is barely possible that there may be some direct oxidation by the central nervous system, by means of the olfactory bulb (as in some animals), which function if it exists in man would be prevented by obstructive lesions of the nose.

4. *The tests for the reflex neuroses.* These are two in number, the probe test and the cocaine test. The former consists in searching with a small nasal probe to find somewhere in the nose a special area of hyperæsthesia which can be the seat or source of a reflex, or to see by sounding all parts of the nasal fossa whether we can succeed in reproducing the phenomenon in question. This sounding should be made previous to the use of cocaine, since the latter may so benumb the mucous membrane as to negative the result.

Cocaine is an excellent test if the symptom happens to be present, and conclusive when the result is positive, for if a phenomenon disappears at once under the influence of cocaine, there can be no doubt of its reflex nature. Of course, symptoms due to stenosis, being chronic, cannot be expected to disappear by the temporary reduction of the swelling produced by cocaine. Sometimes, indeed, reflex phenomena fail to disappear on the use of cocaine. We think this is likely to happen where the erectile tissue has been replaced by hyperplastic or cicatricial tissue that has no contractile properties.

A source of error may exist, if it be true that headaches are sometimes due to the rarefaction of air in the accessory cavities brought about by the closing up of their orifices; for then this symptom would probably be relieved by a measure which reduces the swelling to the extent of freeing these orifices and permitting the entrance of air into the cavities. To recapitulate, then, a symptom known to be of nasal origin is judged to be reflex in nature:

1. If associated with a nasal lesion without stenosis, or the stenosis is not permanent.
2. If accompanied by known reflex phenomena.
3. If it disappears with the removal of the lesion, especially when obstruction still persists.

4. If it be of a paroxysmal character.
5. If there be a definite area of hyperæsthesia.
6. If the symptom absent reappears upon contact of the probe.
7. If the symptom present disappears on the use of cocaine.

On the other hand, the evidence is in favor of a stenosis causation if the symptom in question :

1. Is associated always with obstruction, and that of a marked degree.
2. If the obstructive lesion is of a permanent kind, as from hypertrophy.
3. If the patient suffers from effects of stenosis, such as anæmia and malnutrition, which could well account for the symptom.
4. If the symptoms disappear only upon the return of normal nasal respiration.
5. When the symptom can be best explained upon the hypothesis of an obstruction.
6. When the special reflex tests fail.

The following cases were followed with above mentioned distinctions in view. They are presented on account of the prominence of the psychopathic and neuropathic phenomena.

CASE I. Headache, despondency, with suicidal tendencies; drowsiness.—E. G., female, aged fifty years, married; has had five children, of which three died young. Family history develops that her mother suffered with inflammatory rheumatism, asthma, and dropsy. The patient when a child fell and injured her nose; since about that time she has suffered with headaches. Recently the headaches have become very severe, and patient began to have certain nervous symptoms, on which account she applied for treatment at the Neurological Department of the Emergency Hospital. Her headaches are described as an intense, aching, pulsating kind, being located in the forehead, over the eyebrows and in the temples, whence the pain radiates downward. The patient has restless nights and disturbing dreams, out of which she often awakens with a start. Is for the most part despondent, and has what she terms "crying-spells" at least two or three times a week; would frequently seclude herself and would cry, and felt that no one was interested in her and that she wanted to die. She relates that on one occasion she took a carving-knife with her with the intention of ending her life, but was prevented by its being discovered by her husband.

In addition to these troubles she has pains in her shoulder, and at times a pain resembling stenocardia, and is deaf in the right ear. She gets very drowsy during the day, so that it becomes a great effort for her to attend to her household duties.

Breathing through the nose is obstructed, and mouth-breathing is the rule.

Examining the nose, I found a sigmoid bend in the septum, running antero-posteriorly, the convexity anteriorly being to the right, posteriorly to the left. Besides, on the left side some mucous polyps were to be seen.

May 17th, found that headache was induced by manipulation in the

nose. Removed polyps by the cold snare. Nasal respiration was rendered much easier, and the patient in a couple of weeks was considerably improved in spirits, and was able to attend to her work better than for some years.

A month after first operation she had another of the "crying-spells," had still headache, though not quite so severe, and was drowsy at times. On examination found more polyps, which, with accumulation of inspissated mucus, nearly blocked the right side. These conditions were removed, with the result of giving patient fairly good breathing room. In time she began to improve in every way, the pains in the shoulder disappeared, she was no more drowsy, and six months after first operation there were no stenocardial attacks or crying-spells.

CASE II. *Vertigo, cramps, drowsiness, palpitation*.—C. S., male, aged fifty-two years, single, grocer; applied for treatment on account of obstructed nose. For several years has been subject to attacks of vertigo; he would feel pain, and have shadows before the eyes. At the same time there would come a sensation of heat over the body, and this would be followed by perspiration and chilliness. For twenty-five years this patient was subject to cramps, especially of the abdominal and calf muscles. Frequently, bending over, a large ball would form from the contraction of the abdominal muscles. The cramps would occur eight to ten times a day, and even sometimes during the night. They were so easily brought on, he says, that even if he would think of a cramp he would have one.

For the last four or five years patient has observed that he gets often drowsy and languid during the day. However good a night's rest he may have had, an hour after rising he feels as if he could go back to bed again and sleep. Suffers also from palpitation of heart, although there are no signs or symptoms of valvular disease.

In April I removed polyps from his nose, and did not see him again until July. He told me then that he had had no cramps since the time of that operation. I found now, upon examination, that there was a large polypoid degeneration of the left middle turbinate, quite filling up that side. I removed this, including in the snare some of the bony structure.

This patient was, unfortunately, lost sight of, and the result of the second operation cannot be learned.

CASE III. *Drowsiness*.—R. C., aged thirty-three years, male, merchant; sought treatment for nasal respiration, which he believed interfered with his singing; he has a good tenor voice, but easily exhausted and high notes uncertain. On inquiry I learned that he had been troubled for a number of years with spells of drowsiness, which had been a frequent source of embarrassment, as often he could not prevent himself from falling asleep in company. He had a habit of taking a nap regularly at the theatre, however interesting the play might be. It was not, he was sure, from want of sufficient sleep at night. He does not suffer from dizziness or headache, nor other, except catarrhal symptoms.

Examination discloses hypertrophic rhinitis, especially of middle turbinate. Cocaine had no effect, swelling not being reduced. The anterior end of middle turbinate was removed. After this, besides improvement in voice, the general health became better and the habit of drowsiness disappeared.

CASE IV. *Drowsiness*.—W. C., aged thirty-six years, male, printer, consulted me because of deafness and buzzing in the ears. Besides these complaints, patient had a great source of annoyance in the fact that for years he has had drowsy feeling and inclination to sleep overtake him during his working hours. His occupation required him to do a great deal of reading, and he owns that it is only with great effort that he can fight off the drowsiness at these times, and in spite of effort may actually fall asleep. He sleeps well at nights and has no headaches, or other symptoms of nasal disease, except on the part of the ears.

Examination shows hypertrophic rhinitis with stenosis, the inferior turbinates being in contact with septum.

By a series of cauterizations we were able to establish good nasal breathing. The patient in a few weeks not only recovered from his deafness and ringing in ears (there was otitis media present), but likewise completely from the drowsy habit. Four months later there had been no return.

CASE V. *Drowsiness; aprosexia*.—A. L., aged twenty-six years, single. This patient has breathed but indifferently through the nose during the past three or four years; mouth-breathing during sleep or upon little exertion. Has occasional headaches, always one when he has a cold. Every afternoon about four o'clock he is accustomed to feel tired, drowsy, and indisposed to exert himself; he has often difficulty in keeping himself awake while at the theatre; sleeps well at night. Lately has noticed that he has not been able so well to concentrate his attention as formerly, and his memory is not so good.

On examination I find that the obstruction to free nasal breathing is due to swelling of the erectile tissue at the posterior part of the septum, most marked on the right side. With trichloroacetic acid was able to reduce this, since which the patient has not suffered from headache or from drowsy attacks. He thinks now his memory is better.

CASE VI. *Head-oppression, despondency, languor, aprosexia*.—L. T., male, aged thirty years, gardener, seeks relief for nasal obstruction to which he has himself attributed the "heavy, dull, numb" feeling in his head, with which he has suffered for about five years, growing gradually worse.

Of late he finds himself often in a kind of languid listless mood, which is continuous through the day, though he feels perhaps the most drowsy about 10 A.M. He has gotten so that he takes no pleasure in anything in life, and has no energy and no ambition, and is for the most part depressed mentally; says generally he does not care to be with people, and thinks he might as well be dead as not.

His memory has also become very defective, and he says he cannot remember anything as long as five minutes.

Patient has an irregular septum, on the left side of which there is a large spur, running along the line of junction of vomer and cartilaginous plate. This I removed with the saw.

Patient reported in a few days that he was much improved and had more inclination for work. His head felt better, and he was mentally less depressed. Dizziness first to be lost. Then noticed that headache was less severe, then less drowsy.

There is still some stenosis to be overcome.

CASE VII. *Petit mal, "daymare," melancholia, photophobia*.—G. W. C., male, aged forty-five years, married, watchman; has suffered for

some years with pains between the eyes and over the eyebrows, and with the sensation of a constricting band passing around the head, over the forehead. His vision has been poor for a long while, and could never be helped by glasses; eyes very sensitive to sunlight, but not to artificial lights.

Patient has vertigo very often; always feels giddy immediately upon rising; states that he is at times suddenly seized with a faintness while walking along the street; there is vertigo; he becomes confused as to his surroundings, and is, as it were, but half conscious.

He has also often attacks of what might be called "daymares," since they are like the nightmare in every way except that they occur during his waking hours. When he is sitting perfectly quiet and unoccupied such a spell comes on; he finds it impossible to move a muscle or to utter a syllable, and he must remain so, he thinks, for several minutes.

The patient becomes occasionally very downhearted; he then prefers to be alone, as though he were not capable of being sociable, and he gets to imagine that no one cares for him as he cares for no one; he is, moreover, oppressed with the apprehension of some calamity about to befall him. In addition to the pains in the head, he has pains in and between the shoulders and in the sternum.

For a long time nasal respiration has been difficult, and he has had considerable naso-pharyngeal secretion.

There is present hypertrophy of all the turbinated bodies, it being most marked on the middle turbinated.

The use of cocaine made the patient feel better, his head would feel somewhat relieved. Began a series of measures to reduce the hypertrophy. The reaction was usually considerable, and he would have severe neuralgic pains. My object at first was to get good breathing room, which I did by cauterizing the inferior turbinated. After that the anterior ends of the middle turbinateds were removed and their bodies further reduced by cauterization.

The first improvement noticed was in the dizziness, the next in the headaches and the general mental condition, and the eye-symptoms did not disappear until the middle turbinateds were well cauterized. The patient now, four months from the beginning of treatment, relates that he seldom gets dizzy, and if so it is but slight; has had but one of the "daymares" since the beginning of treatment; never gets drowsy, and is of a far more cheerful and happier disposition than formerly; and has only soreness in the chest and shoulders, where he formerly had the pain.

CASE VIII. *Headache, nervousness, drowsiness, incubus.*—M. H., female, aged twenty-three years, single; had influenza last winter, which left her with pains in the chest, behind the sternum, hoarseness and fulness in the throat.

Patient is very nervous and has palpitation of the heart on the least exertion; her nervousness she describes as such that touching or leaning against a table or like object is enough to make "her whole body shiver." She has occasional headaches on the right side of the head; has often disturbing dreams—one that is common to her is to dream that she is drowning.

Every day, about noon, she finds herself feeling unusually languid and drowsy, and so tired and heavy that it seems a task to walk, especially to go upstairs.

On examination, I found hypertrophic rhinitis, not advanced, but sufficient to cause stenosis, more marked on the right side.

Cauterized right inferior turbinateds. One month later patient reported that she had no more headache, nor heavy, drowsy feeling, nor the restless nights, and was much less nervous.

As she still had palpitation of the heart, however, I examined her, and found evidence of organic lesion.

CASE IX. *Migraine, vertigo, intolerance of alcohol.*—L. K., male, single; has suffered for five years with attacks of genuine migraine, associated generally with gastric disturbances, nausea, vomiting, etc. The attacks would be precipitated by cold, alcoholic indulgences, or emotional influences. The location is in the forehead and temples, worse on one side, and the pain is described as pulsating and so intense that the head feels as though it would burst. The vision becomes obscured, and there is dizziness, especially when the patient inclines the head forward. These attacks, with all the unpleasant symptoms, are brought on if the patient indulges in beer, even in small quantities.

Examination of the nose discloses some hypertrophic rhinitis. Application of cocaine during attack gave positive result—prompt disappearance of all the symptoms. There can be no doubt that cauterization in this case, as always when the cocaine test gives temporary, will give permanent relief.

CASE X. *Headache, vertigo, flushes of heat, impaired memory.*—A. W., female, aged forty years, married; has suffered for the last three years with daily headache, always located on the right side and accompanied with vertigo. The pain is very intense and such that no jarring or noises can be tolerated.

About a year ago she began to have flushes of heat; they pass over the head and the whole body, and lately have become very frequent, recurring at intervals of half an hour. They come also at night, disturbing her rest. Patient is of highly nervous temperament. Voluntarily she relates that she has observed her memory has lately grown defective.

Examination of the nose disclosed a large septal spur on the right, situated anteriorly and in contact with the inferior turbinated. This was removed with the saw.

For a day or so following the operation the patient suffered from the severest headache and a diffuse erythematous eruption over the nose and neighboring parts.

In about ten days, however, the patient began to feel much improved, flushes of heat were seldom and less marked, and headaches mild. It was seen now that the middle turbinate on the same side as the spur was hypertrophied, and this accordingly was cauterized. Again the hyperæmia about the nose presented itself.

REMARKS AND CONCLUSIONS.

Of the various symptoms enumerated in the above detailed cases, neither the attacks of what can be best termed "daymare," nor the sleepy habit, have been noted before, so far as we have been able to see. Though others have referred to cases of spasmodic twitching of the muscles, especially of the face and eye, and of laryngeal and œsopha-

geal spasm, we have read or heard of no case of the kind recorded here (Case II.) where the abdominal and calf muscles were affected and where the paroxysms were so frequent, so general, so easily induced, and the case of such long standing. The like can be said of the flushes of heat, in Case X., which even extended into the night, disturbing the patient's rest.

Yet all these answered the crucial test of dependence upon the nasal condition in disappearing upon the removal of the latter.

One remark must be made here apropos the causative relation of the affection of the nose to certain symptoms observed, which is that the patient himself rarely suspects or voluntarily suggests such a condition. It seems impossible for him to understand that these remote symptoms can in any way be connected with the organ of smell. Indeed, even when the symptoms have disappeared as a result of treatment directed only to the nose, I have often found patients reluctant to admit the force of the *post hoc ergo propter hoc* argument.

As a reaction of greater or less intensity follows all operative procedures in the nose, lasting from three to ten days, patients ought to be warned that a short-lived accentuation of the symptoms will be likely on this account. It is an evidence of the reflex character of a symptom when it is so influenced. In Cases I. and X. the headaches were made worse, and in Case VII. an entirely new neuralgic attack was superinduced. Twice, as a result of the operation, a diffuse erythema overspreading the nose and neighboring skin took place in Case X., first after removal of ecchondrosis, and second after cauterization, each time disappearing in forty-eight hours.

This was no doubt a vasomotor disturbance, just as were also the pronounced flushes that were peculiar to this case.

Another point to which the attention may be called is that we sometimes have (Cases VIII. and X.) a unilateral nasal lesion which corresponds to unilateral phenomenon, or at least with its greater intensity upon that side. This is always confirmatory evidence of its causative relation.

In separating the reflex symptoms from those the result of stenosis, it has to be admitted that we cannot always draw close lines. Without doubt these two influences do in some instances come into play together.

Case IX. has been given because it illustrates a typical migraine of pure reflex origin. Migraine presents all the characters of a reflex, being paroxysmal and recurring. We saw in this case that an attack was abruptly cut short by an application of cocaine. This was not intended to be final, but experimental, although Renous has contented himself with cocaine in some of his cases.

The dull, oppressive, persistent headache, on the other hand, has rather the characteristics of a stenosis effect. In some cases the head-

ache seemed to be the combined effect of reflex and stenosis, as in Cases I. and VI., where, though the first symptom to improve, it was the last to disappear altogether. We infer from the immediate improvement before the breathing space has become free that a source of reflex has been destroyed, whereas that some pain should persist argues a dependence upon the nasal respiration.

Beside the migraine and the headache and the neuralgias (in part at least), the only other symptoms mentioned above in connection with nasal diseases that are of reflex origin, are the dizziness, the *petit mal*, the flushes, and the spasmodic muscular contractions.

The results of stenosis are all the mental symptoms, despondency, loss of memory, the incapacity to concentrate the attention, the want of energy and ambition, the suicidal tendency, the desire to avoid company, the apprehension of impending disaster, the drowsiness and unconquerable inclination to sleep during the day, the nightmare, and the "daymare" so called.

We call attention to the sleep habit. Though authors have failed to mark this as a symptom of nasal stenosis, it is in fact an invariable one, if the patient is not a mouth-breather. It is easily explained by the overcharging of the blood circulating through the brain with carbonic acid gas. But this alone does not account for it. The breathing of air artificially prepared with a 1 per cent. excess of CO_2 and a corresponding decrease of O , it is known, does not give rise to all the evil effects of breathing the atmosphere of a crowded room. The presence of the organic products of respiration, possibly ptomaines, has much to do with giving rise to torpor, languor, and the like. These two must come into play, because expiration as well as inspiration is hindered.

The sleepy habit cannot be simply compensatory for the want of sufficient sleep at night, although in some cases this acts a part, restless nights being a symptom of nasal obstruction. In some cases, however (III. and IV.), the patient slept well and sufficiently at night.

Though these drowsy spells come on or grow worse at different times of the day in different persons, in the same patient they seem generally to come on about the same time.

The peculiar attacks of what we called "daymare" (Case VII.) are probably produced by the same physiological condition as the ordinary incubus, the patient being in a kind of semi-conscious state.

In Case VIII. it is recorded that the patient had frequent repetition of the same dream, viz., that she was drowning. Such a dream might well be expected as the natural consequence of the suffocative impression made upon the brain by the excess of CO_2 and deficit of O .

The various psychopathic manifestations are probably owing to the combined influence of the impoverished and pathologically altered blood and the stagnation of lymph in the cerebral lymph space by reason of

the obstructive lesion in the nose. The melancholic cast is the most striking and constant feature of the cases seen by me, as also of cases reported by others. The patient is depressed, disheartened, and lacks both incentive and energy for work; he has forebodings of ills, mistrusts his friends, and wishes to be alone; imagines that no one is interested in him, and that he had as well be dead as living; in some cases, as in one of mine, he seeks to rid himself of his afflictions by suicide.

It has occurred to me that the sigh which is associated always with sadness, grief, or otherwise depressed mental state is but an illustration of what we have here represented. For what is the sigh, physiologically considered, but an extraordinary respiratory effort to compensate for a deficient supply of oxygen to the lungs which must attend a nasal stenosis?

Did Shakespeare think of this when he wrote:

“There’s matter in these sighs, these profound heaves;
You must translate; tis fit we understand them.”

EXPERIMENTAL STUDIES ON THE PREPARATION AND EFFECTS OF ANTITOXINS FOR TUBERCULOSIS.

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THE workers in this field have not been idle, though it must be conceded that few definite good results have been attained, and but little progress has as yet rewarded the patient toil expended in attempts to produce a curative or antitoxic serum for tuberculosis.

Simultaneously with the development of tetanus and diphtheria antitoxin—even earlier (1888)—Héricourt and Richet⁸⁸ reported favorable results in transferring immunity to tuberculosis from dogs to rabbits by serum injections. Unfortunately, clinical tests of the efficacy of this serum when applied to human tuberculosis did not prove at all encouraging. Nevertheless, the efforts of experimenters to advance existing knowledge of the toxic products of the tubercle bacilli, to produce an artificial immunity against tuberculosis in animals, and to obtain an antitoxic serum for this disease have been steadily carried on, and some light has been thrown on this all-important and complex problem.

One of us (Trudeau^{88 89}) has been engaged in experiments on immunity to tuberculosis since 1891. The present paper, however, includes only

our studies with serums which were commenced in 1894. While confessing our disappointment at the outcome of most of these experiments, we yet feel warranted in presenting them, because they seem to us to indicate some interesting phases of work in tuberculosis and the care needed to make safe deductions from laboratory experiments.

By analogy the efficacy of any antitoxic serum and the ease with which it is obtainable would seem to be in direct ratio to the degree of toxicity possessed by the poison against which protection is sought. For this reason, to produce and demonstrate antitoxic properties in serums would, *à priori*, be more difficult in a disease so chronic as tuberculosis, on account of the low degree of toxicity of its products. Our attempts to produce serums by our own methods, the antitoxic power of which could be proved experimentally on animals; or to demonstrate antitoxic properties in the serums produced by others, have shown only slight potency for any of them up to the present time. Tuberculosis does not belong to that class known as the acute infectious diseases which kill by acute toxæmia, but to the group known as the infectious granulomata to which syphilis, actinomycosis, and leprosy also belong, and which destroy life not only by the chronic and long-continued systemic poisoning they produce, but by the pathological changes brought about through the localization and growth of the germs in organs necessary to life.

Koch's⁴⁷ assumption seems plausible, that immunity to the toxic products of tuberculosis does not necessarily imply immunity to tuberculosis, and a serum which would neutralize the toxic effects of tuberculin may not prevent the growth of the tubercle bacillus in the tissues and its destructive action on the organs of the body. An efficacious serum for this disease would probably require, therefore, to possess not alone antitoxic, but also germicidal properties; or, at least, the power to excite the organism to germicidal activity. Bactericidal properties have been claimed for certain serums by careful observers, but the specificity of any such action is open to question and the existence of any demonstrable degree of germicidal power in antituberculous serums has not been confirmed generally by other observers.

It is not at all certain that even if bacterial immunity could be produced by any method, the serum of animals possessing this immunity would necessarily be either antitoxic or germicidal. Indeed, one of us (Trudeau⁵⁸) has succeeded in producing a marked degree of immunity in rabbits by preventive inoculation of living cultures of tubercle bacilli attenuated by prolonged cultivation; and yet the serum of these animals which had resisted a subsequent virulent inoculation proved to have but slight if any antitoxic power, and did not seem to influence to an appreciable degree the course of the disease in tuberculous guinea-pigs.

Notwithstanding the meagre results obtained in animal experiments, a good deal of clinical evidence as to the value of serum-treatment has been presented, which, however, is not sufficiently encouraging to be convincing in tuberculosis, a disease which runs without any specific treatment so varied and erratic a course. The clinical evidence has not been considered in this research, and must be judged by itself. These studies have been entirely confined to such experimental proof of the presence of curative and antitoxic properties in serums as could be obtained by laboratory methods.

The nature of the bacterial poisons used in injecting animals with a view to producing curative serums is probably of vital importance to the success of such attempts.

When we began this work the observations of Hammerschlag,³² Koch,⁴⁶ Proskauer and Brieger⁷¹, Hueppe and Scholl,³⁹ Weyl,⁹⁵ Héricourt and Richét,³⁴ Crookshank and Herroun,²³ Richét,⁷⁶ Bâbes,⁴ Zuelzer,⁹⁷ Klebs,⁴⁵ Hahn,³⁰ Kühne,⁴⁹ Hoffman,³³ Matthes,⁶³ de Schweinitz,⁸² and our own agreed in the main as to the presence of poisonous albuminous substances in cultures of tubercle bacilli, which were products of the germ-growth and had chemical reactions like the albumoses, albuminates, and nucleo-proteids,* and all producing the characteristic physiologic action of tuberculin. It is to be noted that large quantities of the filtered culture fluid are borne by healthy animals without immediate toxic effects, while quite small doses may produce death in tuberculous animals within a few hours.

No material addition to our knowledge of these culture-products has been published to the present time. Behring⁹ has recently reported the separation of a more active poison than hitherto obtained. De Schweinitz and Dorset⁸³ have prepared small quantities of a necrotizing substance. More recently Hahn³¹ obtained from crushed living tubercle bacilli a juice having the properties of a hydrolytic ferment. The tubercle bacilli have been found by de Schweinitz,⁸¹ Koch and Proskauer,⁴⁷ and Unna⁹¹ to contain considerable quantities of fat and cellulose, the former having the specific staining reaction. The whole subject evidently requires exhaustive study.

The experiments with dead tubercle bacilli and their extracts by Wyssokowicz,⁹⁸ Maffucci,^{54 55} Daremberg,²⁴ Prudden and Hodenpyl,⁷³ Koch,⁴⁶ Straus and Gamalëia,⁸⁶ Vissman,⁹⁴ Kostenitch,⁴⁸ Grancher and Martin,²⁹ Grancher and Ledoux-Lebard,²⁸ Freudenreich,²⁷ Masur and Kockel,⁶² Abel,¹ Carrière,²¹ Sciolla,⁸⁰ and Bâbes and Proca,⁷ show their marked locally irritant character, and their power to produce tubercles,

* A single phosphorus determination, kindly made for us by Prof. R. H. Chittenden, of the pure proteid obtained from cultures on synthetic media (containing no peptones nor albuminoid) gave a content of 1.52 per cent. This indicated the presence of considerable nucleo-proteid produced by the tubercle bacilli.

aseptic abscesses, cachexia with grave disturbance of the blood-forming functions, and nephritis. In the face of these facts it seemed hardly probable that it would be practicable to use cultures containing tubercle bacilli, living or dead, to create and increase tolerance. At least it appeared unlikely that animals would tolerate doses presumed to be necessary in order to originate antagonistic substances. That the tubercle bacilli substance is necessary to produce immunity was later claimed by Koch in the experiments with tuberculin "R."

We have endeavored to cover many, but not all, aspects of this subject in our experiments, and our methods have varied in some respects from those of other workers in this field whose developments we have followed. Without further discussing the theoretical considerations concerned, we will proceed to the description of our work.

The studies included in Part I. relate to the methods adopted by us in attempts to produce the sought-for immunity in various animals, and the tests of the germicidal and curative properties which might be possessed by such serums. The studies included in Part II. relate mostly to tests in animals of the antitoxic power of serums in tuberculin poisoning.

Thus far we have employed sheep, fowls, asses, and rabbits in attempts to obtain antitoxic serums. Before giving details of the work the following summary will set forth the general methods employed by us. We obtained serums from :

I. Sheep repeatedly inoculated intravenously with filtrate of cultures of tubercle bacilli on thymus bouillon.

II. Fowls that were repeatedly inoculated intraperitoneally with tubercle bacilli of mammalian tuberculosis of increasing virulence, and recovered.

III. Sheep injected subcutaneously with increasing doses of tuberculin.*

IV. Sheep repeatedly inoculated intravenously with living non-virulent cultures of tubercle bacilli.†

V. Ass repeatedly inoculated intravenously with living, non-virulent cultures of tubercle bacilli.

VI. Ass inoculated : (a) Subcutaneously with virulent living cultures of tubercle bacilli ; (b) intravenously with virulent tuberculous material, and recovered ; (c) treated with tuberculin subcutaneously in increasing doses.

VII. Ass injected : (a) Subcutaneously with dead cultures of non

* The tuberculin used in this work was made from full-grown bouillon cultures of non-virulent tubercle bacilli from human source, evaporated over a water-bath to one-tenth volume and filtered through clay. 0.100 c.c. usually sufficed to kill guinea-pigs six weeks tuberculous.

† The cultures denoted "non-virulent" were from tubercle bacilli of human origin, grown four years in the incubator, and which only occasionally killed guinea-pigs in six months to one year.

virulent tubercle bacilli on thymus bouillon; (b) with precipitated tuberculin from cultures of the same non-virulent tubercle bacilli on proteid-free media; (c) alkaline extracts of the bacilli with dead bacilli, subcutaneously; (d) living non-virulent tubercle bacilli.

VIII. Rabbits: (a) Inoculated intravenously with non-virulent tubercle bacilli and recovered; (b) inoculated intraperitoneally with virulent tubercle bacilli and recovered.

With serums from the foregoing we tried to carry out the following plan of tests:

1. Effect of serum on healthy animals.
2. Treatment of tuberculous animals with serums to show influence on course of disease and temperature.
3. Test of germicidal influence *in vivo* and *in vitro*.
4. Test of power to neutralize effect of tuberculin in small and fatal doses.
5. Test of effect on local reaction and temperature produced by tuberculin in tuberculous animals.

We must acknowledge at the outset that, for various reasons, we were unable to carry out all of these tests with all of our serums, and the work is incomplete to that degree. Methods used in some tests were changed in others because they were thought to be fallacious, particularly in testing for anti-tuberculin. Consequently there is no true basis for comparison of all the serums tried. In addition to the serums prepared by ourselves, we have tried five or six from other sources. In the present uncertain state of serum-therapy for tuberculosis it is undesirable to mention the names of their originators.

PART I.

I. *Sheep injected intravenously with filtrate of cultures of tubercle bacilli on thymus bouillon.*

June 26, 1894. No. 1, treated, weight 64 lbs.; No. 2, control, weight 64 lbs. Both animals are "wethers" and in good condition. Began injections of filtrate of cultures of (non-virulent) tubercle bacilli on calf thymus bouillon into sheep No. 1. Four doses: June 26th, 10 c.c.; June 30th, 20 c.c.; July 3d, 25 c.c.; July 11th, 25 c.c. Temperature three hours after first dose 103.8.°

July 16th. Weights: No. 1, 52 lbs. (loss, 12 lbs.; no other effect noted); No. 2, 64 lbs.

August 4th. Weights: No. 1, 57 lbs.; No. 2, 67 lbs.

10th. Weights: No. 1, 56½ lbs.; No. 2, 67 lbs. No. 1 did not recover weight, and on this account bleeding was postponed.

October 27th. No further improvement or change noted. No. 1 bled 500 c.c. by canula. 175 c.c. serum collected. This animal was so much weakened by bleeding that it was killed ten days later. No lesions found at autopsy.

*Effect of No. 1 Sheep-serum on the Course of the Disease and on the Temperature.**

October 27th. Took 6 guinea-pigs, average weight 523 grammes; (a) treated with serum, 4 guinea-pigs, average weight of 504 grammes; (b) controls. Before inoculation (a) received five doses of 4-5 c.c. of the serum subcutaneously; total, 24 c.c. each. No effect to be noted on temperature.

November 5th. Weights: (a) Treated, average 517; (b) controls, average, 511. All were inoculated in groin with virulent material from the lung of a rabbit in which tubercle bacilli were scanty. Each of (a) was injected with 4 c.c. of serum.

12th, 18th and 23d. (a) Injected with 5, 5, and 2 c.c.; total, 12 c.c. Serum pigs lost more weight than the controls. They showed no local irritation.

Result. Average time of death: (a) 44 days; (b) 62 days. Autopsies revealed generalized tuberculosis of all organs. The serum apparently hastened death and caused loss of weight in healthy animals before inoculation.

A preliminary test of the antitoxic power of this serum on pigs ninety-three days tuberculous showed that it did not prevent a temperature reaction after the use of tuberculin, and the outlook was so unpromising that further tests were abandoned. The bleeding of the sheep being postponed so long, the method may be said to have had hardly a fair trial.

II. *Fowls inoculated intraperitoneally with mammalian tubercle bacilli of increasing virulence.*

September 10, 1894. We took 12 fowls (chickens and cocks), two-thirds grown, having an average weight of 1026 gm. The first inoculation was of 1.5 c.c. of an emulsion of non-virulent tubercle bacilli from bouillon culture which had been grown four years in an incubator oven.

October 27th. Average weight 1671. Second inoculation: 0.7 c.c. of an emulsion of non-virulent tubercle bacilli from a bouillon culture which had been cultivated two years.

December 20th. Average weight 1717. Third inoculation: 1 c.c. of an emulsion of a virulent culture (cultivated four months on serum).

January 21, 1895. Average weight (10 fowls) 1686. Fourth inoculation: 2 c.c. of an emulsion of a virulent culture (growing five months on serum).

February 15th. Average weight (10 fowls) 2006. Fifth inoculation: 1.5 c.c. of the juice of crushed lymph nodes from a rabbit; third passage of virulent tuberculosis.

April 27th. Average weight (10 fowls) 1894. Sixth inoculation: 1.5 c.c. of the juice of the lungs and omentum; sixth passage of virulent tuberculosis.

May 22d. (Not weighed). Seventh inoculation: 1.5 c.c. of the juice of the spleen and omentum; eighth passage of virulent tuberculosis.

July 19th. (Not weighed.) Eighth inoculation: 1.5 c.c. of the juice of the omentum; seventh passage of virulent tuberculosis.

* Weight and temperature tables are omitted to economize space

August 10th. Average weight 1684. Ninth inoculation: 1.5 c.c. of the juice of the omentum; sixth passage of virulent tuberculosis.

September 4th. Tenth inoculation: 1.5 c.c. lung; eighth passage of virulent tuberculosis.

During the course of these inoculations only two of the fowls died, and those from injuries received in fighting. The rest were bled to death at various times after the seventh inoculation. Most of them were bled twelve and twenty-six days following the last inoculation. Only small amounts of serum were obtained, and part was preserved by trikresol. In no case was there found the slightest evidence of a past or present tuberculosis on post-mortem examination.

Test of the Germicidal Power of Fowl-serum.

June 15, 1895. We took an emulsion in water of the first culture of tubercle bacilli on serum (virulent). (a) Mixed one-half with 6 c.c. serum; no antiseptic added. (b) Mixed one-half with 6 c.c. of 0.6 per cent. NaCl solution. Both were allowed to stand six hours at room temperature in a dark closet. We then inoculated 3 guinea-pigs, average weight 358 gm., with (a) 2 c.c. each; and 3 guinea-pigs, average weight 345 gm., with (b) 2 c.c. each. All were inoculated subcutaneously in the right groin.

Result: All became tuberculous in the usual way: (a) lived 77 days; (b) lived 80 days. There was no germicidal influence *in vitro* on the tubercle bacilli.

The effect of this serum on the temperature of seven tuberculous guinea-pigs and rabbits was tried, with the result that doses of 1.5 to 2 c.c. seemed to cause some elevation in six hours. The amount of serum was insufficient for more of such experiments.

Influence of Fowl-serum on the Course of the Disease in Guinea-pigs.

September 20, 1895. We took 5 pigs, average weight 514.2 gm., for treatment; and 5 pigs, average weight 487.6 gm., for controls. All inoculated with virulent tuberculous material from lung of guinea-pig; each receiving 0.25 c.c. in the right groin. We began treatment the same day, using subcutaneous doses of from 1 to 2.5 c.c. every three to ten days, and giving a total quantity of 10 c.c. each. Abscesses formed in a few instances, probably from skin infection.

Result: The treated animals lived 57 days; the control animals 58½ days.

Tests of the temperature of these animals showed no perceptible influence of the serum. The limited quantity of serum available precluded tests with tuberculin. The results accord with those published recently by Auclair,³ and were especially disappointing because fowls have such high natural immunity to mammalian tuberculosis and are able to dispose of large quantities of human tuberculous material.

III. Sheep injected subcutaneously with increasing amounts of tuberculin.

IV. Sheep inoculated intravenously with living non-virulent tubercle bacilli cultures and injected with tuberculin in increasing doses.

April 22, 1895. (III.) Sheep (wether), weight 70 lbs. (IV.) Sheep (wether), weight 65 lbs. Sheep (IV.) received 10 c.c. tubercle bacilli

from a non-virulent bouillon culture in the saphenous vein. No harmful effects followed.

May 16th, 10 c.c. same. Weights: (III.) 105 lbs.; (IV.) 80 lbs. After this dose (IV.) lost weight and strength steadily during the summer, so that nothing more was attempted until December of the same year.

December 15, 1895. Weights: (III.) 105 lbs.; (IV.) 80 lbs. *Tuberculin Test.* Injected both with 0.200 tuberculin. The temperature of (III.) rose from 102° to 103.5°; (IV.) reacted from 102° to 105°.

Tuberculin Injections. During the next three months both sheep were injected with gradually increasing doses of tuberculin; at first every second day, then less frequently, according to the loss of weight. (III.) received 19 doses; the largest, 50 c.c.; the total quantity, 184 c.c. (IV.) received 23 doses; the largest, 20 c.c.; the total quantity, 64.5 c.c.

Both animals retained their weight until the maximum dose was reached, which for sheep (IV.) was evidently overwhelming, as it lost 15 lbs. during the following three weeks, finally becoming so weak and cachectic that it was killed. No tuberculous lesions were revealed by autopsy, but the liver and spleen were found much atrophied; there was a calculus in the pelvis of one kidney. The absence of tuberculous lesions and the apparent good health of this sheep up to the time of the tuberculin injections remind one of the effects mentioned later by Maffucci and Vestea⁵⁷ as the result of intravenous inoculations of living tubercle bacilli in sheep. The cachexia in one sheep was probably induced by the tuberculin injections. No signs of hæmoglobinuria were noted in these animals; this is mentioned by Niemann⁶⁶ as occurring after massive doses of tuberculin in goats, owing to the large amount of glycerin contained in it.

Sheep (III.) withstood the dose of 50 c.c. of tuberculin fairly well, and was bled March 21, 1896, five days later. 1000 c.c. were taken by canula from the external jugular vein. The weight decreased 20 lbs. during the following three weeks. Part of the serum was kept aseptic and the rest was preserved with camphor.

*Test of the Germicidal Power of the Serum of Sheep (III.)
Tuberculinized.*

March 23, 1896. We took mixtures of: (a) 6 c.c. of emulsion in 0.6 per cent. NaCl sol. of a washed sputum rich in tubercle bacilli, adding 12 c.c. of a serum without antiseptic. (b) 6 c.c. of emulsion of sputum as above; 12 c.c. of 0.6 per cent. NaCl solution. A stained drop showed one or two tubercle bacilli in a field. The mixture was placed in a cool, dark closet for six hours.

We then took 3 guinea-pigs, average weight 692, each of which received 6 c.c. of (a) subcutaneously, and 3 guinea-pigs, average weight 702, each of which received 6 c.c. of (b) subcutaneously.

Result: All became infected in the usual time, no difference in the course of the disease being observed. (They were therefore used for testing tuberculin later.) Autopsies revealed rather chronic tuberculosis in all. No germicidal influence was manifested by the serum.

Effect of the Serum of (III.) on the Course of the Disease in Guinea-pigs.

March 23, 1896. We took 6 pigs, average weight 721 gm., and treated them with serum; 4 pigs, average weight 766, were taken as

controls. All were inoculated in the right groin with one oese of washed sputum emulsion (same as in above experiment).^{*} Injections of serum preserved with camphor were begun on the following day. It was warmed and administered intraperitoneally to facilitate absorption. Doses of 2 to 5 c.c. were continued every second to fourth day for fifty days. The treated animals received total amounts varying from 50 to 65 c.c.

Result: By the twentieth day all the treated pigs were much more emaciated than the controls. One died from peritonitis from puncture of the stomach in injecting of serum. Three more treated pigs died in fifty days from tuberculosis, while the controls were still vigorous. The controls were therefore killed on the fifty-first day for comparison, and the lesions were found practically the same as in the treated. The serum appeared to act harmfully; at least when given in the peritoneum, though the two remaining treated animals survived 110 to 132 days, showing lesions which were chronic, but not unusual in character. The effect on temperature was not noted in above experiment.

Test with Tuberculin of Serum (III.) Antitoxic Power.

Eight pigs inoculated with sputum were tested on the nineteenth, thirtieth, and thirty-third days of disease with serum and tuberculin mixed, given subcutaneously. The conditions of the experiments were so unsatisfactory that they deserve only brief mention. So far as could be judged, no favorable influence was observable. In some pigs the serum seemed to cause fever, and since the bleeding of the sheep was undertaken only five days after a large dose, it is conceivable that some of the tuberculin may have still been contained in the serum.

V. Ass J.; inoculated intravenously with living, non-virulent tubercle bacilli.

December 13, 1894. Male ass (J.); weight, 445 lbs. Appeared old, but sound. We injected 7 c.c. of an emulsion of tubercle bacilli in 0.6 per cent. sterile NaCl solution into an ear vein. (About one-third went into the subcutaneous tissue, producing induration and a cold abscess.) No effect could be noted on the health of the ass.

January 15, 1895. Weight 460 lbs. We gave successfully 15 c.c. of an emulsion of tubercle bacilli in 0.6 per cent. NaCl solution; the tubercle bacilli were taken from three bouillon tubes. No injurious effect was seen.

March 7th. Weight 480 lbs. We injected 15 c.c. of a similar emulsion of tubercle bacilli taken from 6 tubes, with partial success.

April 22d. Weight, 490 lbs. We attempted to inject 10 c.c. of a strong emulsion of tubercle bacilli in 0.6 per cent. sterile NaCl solution into the external jugular; most of it went into the subcutaneous tissues.

May 16th. Weight, 475 lbs. We gave 12 c.c. of a thick emulsion of tubercle bacilli in 0.6 per cent. sterile NaCl solution into an ear vein.

Result: Died in twelve hours from an embolus in the pulmonary artery. The emulsion was probably too thick and produced a clot. No evidence of tuberculosis of the lungs, liver, or spleen could be found at

^{*} Sputum was used for these inoculations, thinking more nearly to approach the infective power of tubercle bacilli for human beings.

autopsy, nor on microscopical examination of sections. Enough serum was saved from the heart cavities to test its bactericidal influence.

Test of the Bactericidal Effect of Serum. Ass J. (V).

May 18, 1895. (a) 4 c.c. of the above serum, unfiltered, was mixed with 1 c.c. of the crushed and strained juice from the spleen of a tuberculous guinea-pig that had died in five weeks; (b) 2 c.c. 0.6 per cent. NaCl solution was mixed with 0.50 c.c. of the same juice. Both stood five and a half hours in a dark closet. 4 pigs, average weight 315 gm., received 1.25 c.c. each of (a). 2 pigs, average weight 293 gm., received 1.25 c.c. each of (b) in the right thigh.

Result: All became uniformly tuberculous as usual, indicating that the serum had no effect on the bacillus, though the experiment is obviously inconclusive.

VI. *An ass was inoculated subcutaneously and intravenously with virulent cultures of tubercle bacilli and virulent tuberculous material from animals; it was then injected with tuberculin in increasing doses.*

February 25, 1895. *Subcutaneous inoculations.* Female ass (R.); weight, 450 lbs.; full-grown, but young; in fine condition. The normal rectal temperature varies from 98.4° to 99.5°. The first inoculation was of 12 c.c. of an emulsion of the liver and omentum of a rabbit that had died in fifty-one days of acute tuberculosis (fourth passage through rabbits). There were few tubercle bacilli in the emulsion; a cheesy abscess resulted, which was opened and healed.

April 6th. Weight, 455 lbs. Second inoculation: 12 c.c. of an emulsion of the liver and omentum of a rabbit that had died forty days (fifth passage); tubercle bacilli were fairly numerous. An abscess followed.

May 22d. Weight 430 lbs. Third inoculation: 4 c.c. of an emulsion of the liver and omentum of a rabbit that had died in twenty-two days (seventh passage); tubercle bacilli were few. Injections were made in three or four places; no abscesses followed, but there was permanent induration.

June 9th. Fourth inoculation: 4 c.c. of an emulsion of the liver and omentum of a rabbit that had died in forty-nine days (seventh passage); tubercle bacilli fairly numerous. An abscess resulted; otherwise its health remained good. It was turned out to pasture for the summer.

August 9th. *Intravenous inoculations.* First inoculation: 5 c.c. of an emulsion of the lymph nodes and omentum of a rabbit three months tuberculous (seventh passage); it was injected into an ear vein; tubercle bacilli were scanty in the emulsion. No disturbance of health that was perceptible followed.

24th. Second inoculation: 2 c.c. of an emulsion from the lymph nodes and omentum of a rabbit three months tuberculous (eighth passage); tubercle bacilli were numerous. Following this the ass soon became daily thinner and weaker, and breathed somewhat quickly.

September 1st. Losing weight. Evening temperature 100.2°.

13th. Injected with 0.030 tuberculin; reaction to 104°.

November 19th. Gaining weight; evening temperature 100°.

20th. *Tuberculin injections.* Begun with 0.030, and gradually increased every two to ten days for five months. Thirty doses were given, aggregating 173.5 c.c. The last dose was 33 c.c. Her weight

gradually increased from 350 to 420 lbs., and the reactions became less. The last dose caused a temperature of 101° , but no depression. Little disturbance was noted from the tuberculin after the first four or five doses.

May 4, 1896. First bleeding: Ten days after the largest dose, 1500 c.c. of blood was taken from the jugular vein by canula. Some of the serum obtained was preserved aseptically in tubes, while the rest was kept with lumps of camphor added. No depression followed the bleeding, so the animal was turned out to pasture for the summer. During the summer of 1896 ass R. was quite thin, weighing only 345 lbs., but she had regained her weight in the autumn—to 400 lbs. on October 15th.

November 2d. Tuberculin injections were resumed, beginning with a dose of 0.500 c.c., which was followed by a rise of temperature to 102° . The doses were rapidly increased, causing about the same reaction, until December 29th, nearly two months. The last dose was 10 c.c.; the aggregate 46.5 c.c. An interval of thirty days was then given before bleeding, during which time the ass gained 20 lbs. in weight.

January 27, 1897. Second bleeding: 1800 c.c. was taken from the left jugular.

Test of the Germicidal Power of the Serum of Ass R. (VI.).

First serum: The same method was used as in the fowl and sheep serums except that virulent cultures were employed for infective material.

May 6, 1897. (a) 12 c.c. of serum (without antiseptic) was mixed with 6 c.c. of an emulsion of tubercle bacilli from a first culture on serum. (b) 12 c.c. of a 0.6 per cent. solution of NaCl was mixed with 6 c.c. of tubercle bacilli emulsion as above. Both were allowed to stand twelve and one-half hours in a dark closet.

We took 3 pigs, average weight 517 gm., and inoculated them with 3 c.c. each of (a); and 3 pigs, average weight 512 gm., which we inoculated with 3 c.c. each of (b).

Result: After twenty-six days the evidence of uniform disease was so palpable in all that they were killed by tuberculin. All were found to have lesions of generalized tuberculosis.

Second serum: This serum was not tried on animals, but was added to bouillon cultures without heat to test its inhibitive power on the growth of tubercle bacilli *in vitro*.

January 31, 1897. We took 4 flasks containing 50 c.c. each of bouillon + 10 c.c. or 5 c.c. of serum (R. second), 5 flasks containing 25 c.c. each of bouillon + 2.5, 1.25, 0.63, 0.50, and 0.25 c.c. of (R. second), 4 flasks containing 25 c.c. each of control bouillon + 10, 1.25, 0.50, and 0.25 c.c. of hydrocele fluid, and 1 flask containing 25 c.c. of control bouillon only.

All were planted with non-virulent tubercle bacilli, surface growth. Only one flask became contaminated. No retardation of growth was seen unless the serum was present in large proportion. In the latter case the alkalinity was so increased by the serum that from comparison with the hydrocele fluid cultures and from former observation we may attribute the lessened growth to the wide differences in this respect.

Result: There was no reason to suspect any antibacillary effect of a specific nature from the above experiment.

Effect of the First Serum of Ass R. (VI.) on the Course of the Disease in Guinea-pigs.

May 4, 1896. 10 pigs were inoculated in the right groin with a virulent culture of tubercle bacilli, the first culture on serum. 6 pigs, average weight 500 gm., were treated with serum. 4 pigs, average weight 520 gm., as controls (a). 2 pigs, average weight 515 gm., as controls (b); which were not inoculated, but were treated. 1 pig, weight 541 gm., as control (c); which was neither inoculated nor treated, but was kept in the same cage for comparison.

Injections of serum into the peritoneal cavity were begun on the fourth day, and were continued every second or third day for fourteen doses, which ranged from 1 c.c. to 6 c.c. The average total amount for each pig was 45.7 c.c.

Result: The treated died on an average of 45.5 days after inoculation. Controls (a) died on an average of 42.5 days after inoculation; controls (b) died on an average 50 days after inoculation; control (c) gained 33 grammes weight.

No effect could be observed either on the appearance of the treated animals or on their temperature and lesions as compared with the controls. The controls (b), which were to show the effect of the serum on healthy animals, were inoculated by mistake May 20th. They serve, however, to show that the serum failed to prevent or modify the disease when given prior to inoculation. All died with generalized tuberculosis. The prolongation of life was not sufficient to be significant.

Possibly a more favorable result would have been obtained with this serum had it been used subcutaneously in smaller doses. The quantity at our disposal was too small to carry out a second test and to try its effect on tuberculous eyes of rabbits. The second serum from ass R. was thus tried, as will be seen hereafter. (The experiments on the antituberculin or antitoxic power of first serum, ass R., will be given in Part II.)

Effect of the Second Serum of Ass R. (VI.) on the Course of the Disease.

February 12, 1897. 15 pigs were inoculated in the right groin with a culture of tubercle bacilli of moderate virulence. 5 pigs, average weight 634 gm., were treated with the second serum. 5 pigs, average weight 602 gm., controls.* (a) 1 pig, weight 580 gm., control (b), was not inoculated, but was treated. 1 pig, weight 455 gm. control (c), neither inoculated nor treated.

Injections of serum were begun next day under the skin of the abdomen; doses of from 0.050 to 1 c.c. at intervals of one to three days were given until May 4th—nearly three months. No marked induration of skin nor abscesses resulted. The total for each pig was 17.4 c.c.

Result: 4 treated pigs died after an average of 95.2 days; 1 treated pig survived four months, and was then killed. 2 controls (a) died after an average of 75.5 days; 3 controls (a) survived four months and were then killed. 1 control (b) lost 10 grammes in four months. 1 control (c) gained 15 grammes in four months.

No influence was manifest on the animals, nor on their temperatures taken before and after doses of 1 c.c., and compared with controls.

* The other five pigs were treated with Serum VII. See page 704.

Nothing unusual was noted in the lesions. All had chronic generalized tuberculosis.

This experiment was in direct contrast to that with the first serum in the less virulent inoculation and with smaller doses of serum given under the skin instead of into the peritoneal cavity. The serums seemed to have no favorable influence either way.

VII. *Ass injected subcutaneously*: (1) with dead non-virulent cultures of tubercle bacilli on thymus bouillon; (2) with precipitated tuberculin made from cultures of non-virulent tubercle bacilli on proteid-free media; (3) with alkaline extract of tubercle bacilli mixed with dead tubercle bacilli; (4) with living non-virulent tubercle bacilli.

January 4, 1895. Female ass (H.), weight 475 lbs., full-grown, rather "phlegmatic;" in good condition and apparently sound; normal rectal temperature—97° to 98°.

1. *Injections of non-virulent cultures of tubercle bacilli on thymus bouillon which had been killed by trikresol.* Began injections of emulsion of tubercle bacilli in thymus bouillon culture with 0.2 per cent. trikresol, on alternate sides of neck. January 4, 1895, 1 c.c.; 11th, 1.5 c.c.; February 8th, 5 c.c.; March 4th, 8 c.c.; April 8th, 10 c.c.

No rise of temperature followed these injections, and only indurated spots remained; no abscesses resulted. The animal was not visibly affected, except that she lost 15 pounds, which was regained by April 17th, when she was turned out to pasture for the summer. Nothing further was done until December 11th, when a dose of 0.500 tuberculin was injected without an ensuing reaction.

December 12th. 2. *Injections of precipitated tuberculin.* We began injections of toxin obtained from cultures of non-virulent tubercle bacilli on liquid media containing asparagin, mannit, or ammonium carbonate in mixtures with salts as in the formulas of de Schweinitz⁸⁴ and Proskauer and Beck.⁷⁰

The toxin was prepared as follows: To the clay-filtered culture fluid 2 per cent. acetic acid was added, followed by ammonium sulphate to saturation. Nearly all the proteid matter arising from the fully grown cultures was thus precipitated. It was then collected, redissolved in water, reprecipitated by alcohol, filtered, washed with alcohol and ether, dried, and weighed. Solutions of the solid substance, 0.005 in 1 c.c., were made in weak sodium carbonate. 0.5 c.c. of this preparation was not fatal to tuberculous guinea-pigs, though producing high temperature and local irritation at the site of injection.

This pure tuberculin or toxin was injected every second day in increasing doses up to 7 c.c. until January 30, 1896. The total quantity was 26.85 c.c. Abscesses then formed at site of injection, and occasionally thereafter from the following treatment:

3. *Injection of alkaline extract and dead tubercle bacilli.* The toxin was next prepared by adding 1 per cent. NaOH to the cultures before filtration; warming to 40° C.; filtering through cotton; precipitating by 2 per cent. acetic acid, which gave an abundant flocculent substance; filtering again; washing out the acid with water by decantation; re-solution in weak alkali. Naturally this fluid contained many dead and disintegrated tubercle bacilli, as the filtration was carried through cotton and paper. We found it impracticable to filter through clay, since most of the dissolved poison was left on the filter.

From February until June, 1896, fifteen injections were given subcutaneously, in increasing doses, of these solutions well diluted and freshly made. The largest amount represented 3500 c.c. of cultures. In the aggregate, 17,500 c.c. of cultures grown in 100 to 150 c.c. flasks were used. Considerable induration persisted after these injections, and on three occasions they were followed by septic abscesses which necessitated an interruption of the treatment. The solutions not being sterilized, and the dissolved poison and dead bacilli both being such strong irritants, we despaired of further increasing the doses. Throughout the time of treatment the ass had but little disturbance of health except at the time of the abscesses, when she did not eat well. The abscesses were opened as soon as formed, and healed promptly. By June 1st she had lost fifteen pounds, but regained it by the 15th inst.

June 24, 1896. First bleeding: Nine days after the last dose of toxin and tubercle bacilli, 1000 c.c. of blood was drawn from the right external jugular vein; 400 c.c. of serum was obtained aseptically. All the abscesses had healed at this time except two or three small pustules. The animal was then put into the pasture. Although this had been an unpromising experiment, owing to the abscesses, we decided to try the serum, omitting the germicidal test on animals.

Effect of First Serum, Ass H. (VII.), on Course of Disease in Guinea-pigs.

June 26, 1896. 10 pigs inoculated in right groin with tuberculous material from a guinea-pig; virulent infection. 6 pigs, average weight 710.8, treated with serum; 4 pigs, average weight 713.7, (a) controls; 2 pigs, average weight 780, (b) controls, not inoculated, but treated with serum.

The serum (with camphor added to insure preservation) injections into peritoneum were begun on next day and given every second day for a month with doses of 1 to 7 c.c.; total quantity, 41.5 c.c. each.

Result: Average time of death: treated 47 days; (a) controls 49.7 days. Controls (b) lost weight and were inoculated later, but developed the disease in usual way. The temperatures of all were taken on the twenty-second day of disease and after the dose of 7 c.c. serum, without showing any influence from serum. The antituberculin tests will be found with the other serums in Part II.

4. *Ass inoculated subcutaneously with non-virulent living cultures.*

November 7, 1896. Took ass H. (same as was used in VII.) after being in pasture all summer. Weight 490 lbs. Indurations from former treatment remained, but were smaller.

The first inoculation was of 25 c.c. of culture fluid with tubercle bacilli rubbed up in mortar, weighing in moist condition 0.0221—from an actively-growing culture of non-virulent tubercle bacilli on acid bouillon. The injection was into the right shoulder. The temperature six hours later was 99°.

November 20th. Second inoculation: 25 c.c. of a culture containing 0.1353 tubercle bacilli into left shoulder. Several small aseptic abscesses from the first inoculation were to be seen.

December 7th. Third inoculation: 25 c.c. (the tubercle bacilli were not weighed, but more were used); the injection was made into the right groin; there was no abscess from last dose.

19th. Fourth inoculation: 40 c.c. into the left groin; no abscess resulted.

January 6, 1897. Fifth inoculation: 40 c.c. into the right shoulder; temperature 98.5; no abscess followed.

Much induration of the skin remained after all the inoculations, but little disturbance of health was noticeable. Weight 500 lbs.

February 6, 1897. Second bleeding: Thirty days after the last dose, weight 510 lbs.; 2000 c.c. blood was taken from the right jugular vein; 1000 c.c. serum was collected aseptically.

Germicidal Power of the Serum, Ass H., in Culture.

February 13, 1897. Second serum: We took flasks each containing 50 c.c. bouillon + 10 c.c., 5 c.c., or 2.5 c.c. serum; flasks each containing 50 c.c. bouillon + 2 or 1.25 c.c. $\frac{1}{10}$ normal serum, and control flasks each containing 50 c.c. bouillon + 2.5 c.c. or 1 c.c. of NaOH solution.

The serum was added aseptically, no heat nor antiseptic being used. The NaOH was added to the controls because the serum increased the alkalinity of the bouillon. All were planted with non-virulent tubercle bacilli from a bouillon-serum culture.

Result: March 20th, thirty-five days after all had grown luxuriantly, there were no contaminations; no inhibitive influence of the serum was to be seen.

Effect of the Second Serum of Ass H. on the Course of the Disease in Guinea-pigs.

February 12, 1897. 15 pigs were inoculated in the right groin with the culture of tubercle bacilli of moderate virulence. 5* pigs, average weight 620 gm., were treated with serum subcutaneously. 5† pigs, average weight 602 gm., (a) controls, were not treated. 1 pig, weight 575 gm., (b) control, was not inoculated, but was treated. 1 pig, weight 455 gm., (c) control, was neither inoculated nor treated.

The doses and intervals were the same as in the experiment with the serum of ass R., the two serums being compared in this way. (See page 703.)

Result: 4 treated pigs lived on an average 106.7 days; 1 survived 4 months; 2 controls lived on an average 75.5 days; 3 survived 4 months. No influence could be ascribed to the serum so far as the lesions or the course of the disease were concerned.

Effect of the Second Serum of Asses R. and H. on the Course of Eye-tuberculosis in Rabbits.

January 30, 1897. 12 rabbits were inoculated in the anterior chamber of the left eye with one drop of weak emulsion of a pure culture of tubercle bacilli of moderate virulence. (R.) 4 rabbits, average weight 2028 gm., were treated with serum from Ass R. subcutaneously. (H.) 4 rabbits, average weight 1741 gm., were treated with serum from Ass H. subcutaneously. (C.) 4 rabbits, average weight 1705 gm., were used as controls.

February 12th. Twelfth day. We began treatment with doses of from 2 to 6.5 c.c. of the serums every second or third day, under the

* Same lot as "second serum, ass R.;" page 703.

† Same controls as in "second serum, ass R.;" page 703.

skin of the abdomen; treated until March 23d—forty days; the total amount given each was 66 c.c.

Result: The serum produced induration, but no abscesses nor disturbance of health. There was no change in the appearance of the eyes in the treated which was not seen in the control rabbits; no difference in temperature was noted when taken six hours after the first dose of serum; the disease in the eyes ran the usual course.

VIII. *Rabbits:* 1. *Inoculated intravenously with non-virulent cultures of tubercle bacilli; recovered.* 2. *Inoculated in peritoneal cavity with virulent tuberculous material; disease arrested or recovered.*

March 31, 1896. We took 3 rabbits, weights 2210, 2210, 2085 gm. Each received 1 c.c. of an emulsion of a pure culture of non-virulent tubercle bacilli in water into the aural vein. After temporarily losing weight they appeared completely well six months later.

October 3d. All were inoculated intraperitoneally with an emulsion from a caseous lung of a monkey. The three control rabbits all died in two months. All the above animals survived and were apparently recovered by January 2, 1897, when they were bled to obtain serum. Some chronic lesions were found in one animal, but were not progressing.

Effect of the Serum of Rabbit (VIII.) on the Course of the Disease.

January 5, 1897. We took 5 pigs, average weight, 555.2 gm., for treatment; and 5 pigs, average weight 553.4 gm., for controls. All were inoculated in the right groin with a pure culture of tubercle bacilli of weak virulence.

7th. We gave subcutaneous doses of 0.050 to 0.850 c.c. of the rabbit serum every second to third day, until February 21st—forty-five days. Total quantity, 9.65 c.c. each. Induration of skin was produced, but there were no abscesses; no other effect was perceived.

Result: 4 treated pigs died after an average of 92.5 days; 1 survived 4 months and was then killed. 3 control pigs died after an average of 77.3 days; 2 survived 4 months and were then killed. No difference in the lesions was to be seen on post-mortem examination, but the serum pigs that died outlived the controls that died. In a single tuberculous pig no effect on the temperature was produced by a dose of 1.70 c.c. The limited quantity of this serum precluded further investigation.

In addition to the serums prepared by ourselves, we made a preliminary test of some serum said to be from a horse treated with toxins obtained from virulent bacilli. We injected three tuberculous pigs every other day for two months without apparent effect in prolonging life, and hence were unable to confirm the author's statements regarding the serum.

We must state with reference to all the foregoing experiments in treating pigs with serums that they were only preliminary, and the results with so few animals are not viewed by us as conclusive.

(To be continued.)

REVIEWS.

MANUAL OF CHEMISTRY. A GUIDE TO LECTURES AND LABORATORY WORK FOR BEGINNERS IN CHEMISTRY. A TEXT-BOOK SPECIALLY ADAPTED FOR STUDENTS OF MEDICINE, PHARMACY, AND DENTISTRY. By W. SIMON, Ph.D., M.D. Sixth edition. Philadelphia and New York; Lea Brothers & Co., 1898.

LABORATORY WORK IN PHYSIOLOGICAL CHEMISTRY. By F. G. NOVY, Sc.D., M.D. Second edition. George Wahr: Ann Arbor, 1898.

THE application of chemical study to biological processes constitutes one of the most important steps in the modern advancement of exact science. In the earliest stage it was limited to the determinations of proximate principles, animal as well as vegetable substances being studied purely from the analytical stand-point. In the earlier days of modern physiology the study of that subject was largely confined to that aspect which Du Bois Reymond used to term "Die reine Physiologie." The chemical study of physiology for physiological purposes soon came into vogue, and through the work of Bunge, Hoppe-Seyler, Schmidt, Pflueger, the elder Voit, and Kühne assumed dimensions equal to those of the elder branch. The new pathology of Virchow carried in itself from the first the chemical tendency, though this was for two decades almost entirely overshadowed by the morphological spirit. In the last twenty years, however, chemical pathology has made immense strides, and to-day promises greater rewards to the scholar than does morbid anatomy. In the last dozen years, two especial fields have become gradually differentiated: the chemical study of metabolism, natural and diseased; and of the bacterial processes. As an example of the first statement: the morphological study of the thyroid body has furnished very little explanation of the morbid relations of that tissue; the ultimate chemical analysis of that tissue has thrown some additional light upon its morbid relations; but it is alone the study of the deranged metabolism in connection with diseased states of the thyroid body which can promise clear elucidation. Familiar examples of the same truth could be multiplied at will; the diseases of the pancreas and kidneys are good illustrations. Degeneration of the renal epithelium, modifications of the renal vessels, and albuminuria have been commonplace knowledge for years, but they furnish no explanation for uræmia. With respect to bacterial processes, it is now generally admitted that the botanical or morphological study of bacteria cannot in most instances explain the infections; the discovery and study of toxins, alexins, enzymes, etc., illustrate the vast strides accomplished by the chemical investigation of the bacterial processes.

It is obvious that in the education of physicians the chief aim should be the clear apperception of what constitutes health and disease. Symptomatology and diagnosis are open portals to the man who understands

disease in its broadest and deepest sense, while to therapeutics he is closer than is the pharmacologist. In such teaching of what constitutes disease the chemical study of biological processes must bear an important rôle, much more important than the rôle currently allotted to it in the present curriculum. It is mainly because Simon's *Text-book of Chemistry for Medical Students* does not sufficiently conform to these requirements that it is disappointing. 450 pages are devoted to theoretical chemistry, and present an admirable foundation for the student's study of chemistry. The *sixty-three* pages devoted to the physiological chemistry are entirely inadequate to the subject, and these chapters do not begin to teach the student what he needs to know and has a right to be taught. Thus, entirely apart from the consideration of the matter in this work, the plan of the book falls short of the necessary requirements.

The subject-matter contained in the section on physiological chemistry is fairly satisfactory so far as it goes, but it is in many directions so scant and insufficient that the student cannot acquire from it a comprehension of the subject. Many of the descriptions are so short as to be scarcely more than definitions. References to pathological alterations are almost entirely wanting, while discussions of metabolism are still less in evidence. Owing, likewise, to lack of space, the practical methods are not properly presented. For example, for the estimation of uric acid only the obsolete method of Heintz is given; for the alloxuric bodies no method is described. It is greatly to be regretted that so competent a chemist as the author has not seen fit to present to the student-public a more extended and adequate discussion of his subject.

Professor Novy's book cannot be so criticised. It is admirably adapted to the needs of students, and cannot fail to stimulate a greater interest in this line of work. The paragraphs are interspersed with pathological and clinical comments which, while obviously not pretending to be complete, are certain to contribute to the interest of the study and at the same time illustrate the deep clinical importance of a knowledge of pathological chemistry. It seems to us that the one fault in the book which should be pointed out is the failure to mention details in the application of methods which students need to be taught. A good example is furnished in the description of the Kjeldahl method. It is not stated whether or not the nitrogen of both nitrates and nitrites is determined; the use of cupric sulphate and potassium permanganate is alone mentioned, the use of the oxide of mercury, a more rapid and energetic aid to the oxidation—and the best one to employ with other substances than urine—is not alluded to; there is no caution against excessive heating early in the digestion; there is no caution against heating the side of the flask above the level of the acid beyond the decomposition-point of ammonium sulphate; the dangers of excessive alkalinization before distillation, and of too rapid distillation are not mentioned. These are little points in technique which are unconsciously practised by the experienced worker, but the student needs to have them all noted. A similar glossing of details is seen in other descriptions. The faults are, however, so few in comparison with the many merits of the work that it should be urged upon students of medicine and practical clinicians as a trustworthy guide and teacher.

A. E. T.

FONCTIONNEMENT DE LA MAISON D'ACCOUCHEMENTS BAUDELLOCQUE;
CLINIQUE DE LA FACULTÉ, dirigée par le PROFESSEUR ADOLPHE
PINARD. Année, 1897. Paris: Steinheil, 1898.

REPORT OF THE BAUDELLOCQUE OBSTETRIC CLINIC, under direction of PROF.
ADOLPHE PINARD.

THE appearance of the annual report of the Baudellocque clinic is always an interesting event in obstetrical literature, but this year it has more than ordinary interest on account of the practice pursued for some time in this clinic of administering Marmorek's antistreptococcic serum as a preventive as well as a curative measure in the treatment of puerperal infection. For those who are convinced of the efficacy of serum-therapy in sepsis, the use of the antitoxin to prevent as well as to cure sepsis is quite rational. The regulation of the clinic, therefore, to administer the serum in every case in which there is an extra predisposition to infection, as in long labors, premature rupture of the membranes, etc., is logical. Unfortunately, in one sense, the clinical results of this treatment are inconclusive. The mortality from sepsis is very low, it is true, less than a quarter of one per cent., but it has always been low of late years in this excellently-managed institution, and there is no striking difference since the prophylactic use of the serum was adopted. The morbidity was extraordinarily low, less than 7 per cent., but the same immunity from fever is shown in the records of other well-managed maternities in which the serum is not employed at all.

Two other interesting features of the report are the preference shown for the Porro operation in cases requiring Cæsarean section and the extraordinary diminution in the number of symphysiotomies as compared with former years.

B. C. H.

ON CARDIAC FAILURE AND ITS TREATMENT. By ALEXANDER MORISON, M.D. Edin.; F.R.C.P. Edin.; Physician to Out-patients to the Great Northern Central Hospital and the Paddington Green Children's Hospital; Physician to the St. Marylebone General Dispensary. Pp. xx. 256. London: The Rebman Publishing Company, Ltd., 1897.

THIS book has been written with especial reference to the use of baths and exercise. The number of works upon this subject presented from the Nauheim stand-point is steadily increasing, and when compared with the earlier—for example, Thoma's—this shows a marked improvement. The first rush to get into print resulted in books which injured the cause they were designed to plead, and were not creditable either to the author or the profession of which he was a member. The present is an earnest attempt to offer the truth, with a predilection toward certain phases of treatment which have received but little attention in this connection. The author is unfortunate in his title, which may mean much or little, but is certainly indefinite. He fails to appreciate the mechanical problem to which vascular changes give rise in his enumeration of the causes of cardiac failure (p. 90). His argument as to the "buffer" action of the ganglionic system presents in another form an explanation of unex-

pected betterment in certain desperate states. Of new matters we may cite the author's sensory dynamometer (p. 169), the use of sea-water in making up baths (p. 118), and the appreciation of Zandee's methods of exercise (pp. 157 *et seq.*).

This book presents a broad view of the subject, and is written in a fair and candid spirit. Of the defects to be found in it many might be cited: peculiarly constructed sentences, of which some examples are to be found on p. 115; variation in proper names, as v. Busch (p. 213), who appears as Bach on p. 132 and p. 145; cactus certainly does not belong to the digitalis group, as stated on p. 94; the purpose of blood examination in cardiac disease is by no means similar to that of the urine in renal disease (p. 81), although it may be equally important; finally, the use of the word "case" when "patient" is intended—patients have died because their "cases" were treated. Contradictory statements are found in regard to the publication of Schott's observations with radiography on pp. 200 and 202; the defects of these observations have already been pointed out in this JOURNAL. The fairest estimation of the value of baths and exercise in cardiac disease is, we believe, that of Stewart, presented at Carlisle in 1896, and this the author quotes with approbation (p. 222). Of the appendix by Dr. Groedel little need be said, for its dogmatic statements do not impress the reader who has followed the literature. Much as we deprecate the presentation of special pleading under a general title, in this work the *ex parte* argument has careful consideration and has been logically set forth, resting upon well-known facts.

R. W. W.

A CLINICAL, PATHOLOGICAL, AND EXPERIMENTAL STUDY OF FRACTURE OF THE LOWER END OF THE RADIUS. By JOHN B. ROBERTS, A.M., M.D. Philadelphia: P. Blakiston, Son & Co., 1897.

DR. ROBERTS describes in detail the cases and specimens seen and collected by him of fracture of the lower end of the radius having an anterior displacement of the distal fragment. Dr. Roberts has seen no fresh fracture having the displacement. He has seen four cases in which the accident occurred some eighteen months or more previously in each instance.

Some thirty-one specimens are described, found after careful and persistent search in different museums, and collected from the experience of private surgeons, all of which specimens suggest or demonstrate a lesion like the one under consideration.

Dr. Roberts then describes ten experiments to determine the effect of extreme and forcible flexion upon the wrist and lower end of the radius. The causes and mechanism of this especial deformity are discussed briefly.

Roberts concludes that the fracture of the lower end of the radius with anterior displacement of the distal fragment is caused in three ways: first, tearing off of the lower end by a cross-breaking strain exerted through the posterior ligaments during extreme flexion, when the force is applied to the back of the hand in front of the anterior surface of the radius; second, crushing of the anterior portion of the

bone between the wrist-bones and the shaft, or mutual penetration of the diaphyseal and epiphyseal portions; and third, rupture of the bony tissue of the weakest point by decomposition of the force to which the limb is subjected. Nothing new is suggested under the heading of Diagnosis and Treatment.

This contribution of Dr. Roberts is valuable in that it calls attention to an evidently rare deformity associated with Colles' fracture, and one not yet recorded as seen by any surgeon in the fresh and recent fracture. The possibility of this deformity being due to forces acting after the initial force or during treatment is to be borne in mind.

The writer can imagine this deformity being easily produced in a misuse of many forms of manufactured splint so commonly used for the treatment of Colles' fracture. The old Lewis splint may cause just such a deformity.

Non-reduction of deformity, or the neglect of cases already reduced and concealed by cumbersome apparatus, may be causes of the occurrence of this anterior displacement.

C. L. S.

"CATAPHORESIS," OR ELECTRIC MEDICAMENTAL DIFFUSION AS APPLIED IN MEDICINE, SURGERY, AND DENTISTRY. By WILLIAM JAMES MORTON, M.D, Professor of Diseases of the Mind and Nervous System and Electro-Therapeutics in the New York Post-Graduate Medical School and Hospital. One large 8vo, with 227 illustrations. New York: Published by the American Technical Book Company, 1898.

IN this work Dr. Morton, who is the recognized authority on "cataphoresis," has supplied a much-needed volume in which the whole subject is systematically presented in six parts, all the data to be found therein being both interesting and instructive. Part I., Historical, treats of the early experiments, modern revival, and developments of Electric Medicamentation as Applied to Dentistry. Part II. Physics and Physiology. Part III. Apparatus and Outfit. Part IV. Special Applications in Dental Surgery. Contained in these four parts which are especially valuable, the busy practitioner may find clear and concise descriptions of the origin, apparatus, and methods of application not elsewhere attainable, for prior to the publication of this much-needed volume the only sources of information on electric medicamental diffusion were occasional papers appearing in the professional journals, and these, being for the most part the contributions of individuals to whom the subject was new, lacked the elements of precision and authority which belong to the work of an author who, like Dr. Morton, has made the subject a life-time study.

The absence of a systematic literature of cataphoresis has doubtless deterred many practitioners from employing it in practice, but this tardiness has not been confined to the older practitioners, as stated by the author; on the contrary, the older members of the dental profession are the ones who have evinced the greatest interest in it, and have done most toward the development of its clinical uses.

The author's manner of elucidating his subject is attractive and cal-

culated to retain the interest of the reader throughout. Part V., devoted exclusively to special applications in dental surgery, treats of the subject in a manner indicative of much study and familiarity with dental operations. Anæsthetization of sensitive dentine, anæsthesia of the gums, bleaching of teeth by cataphoresis, antiseptis or sterilization of the teeth, and diffusion from soluble electrodes, include all the conditions to which electrical diffusion is applicable in the practice of dentistry, and its employment in the treatment of cases belonging to this category is made so clear by the text and the admirable illustrations, that no one interested in that branch of therapeutics can well afford to be without the book.

The work closes very appropriately with Part VI., on the use of cataphoresis in the staining of dead tissues in microscopical work.

N. S. E.

MANUAL OF OPERATIVE SURGERY. By H. J. WARING, M.S., M.B., F.R.C.S., Demonstrator of Operative Surgery, St. Bartholomew's Hospital, etc. 12mo, pp. 661. Edinburgh and London: Young J. Pentland, 1898.

THE author has intended this volume for a text-book for classes in operative surgery on the cadaver, but it is valuable as a book of reference on operative procedures on the living. It gives a description of a good many operations not usually performed in the surgical laboratory, and pays some attention to the conditions demanding the operations discussed. It, of course, omits entirely the consideration of symptomatology and diagnosis, which would be foreign to its purpose.

It is fully illustrated, and many of its diagrammatic cuts are unusually suggestive, though not artistic. Among the illustrations of instruments there are depicted some which seem very clumsy and old-fashioned to American eyes.

The volume is well arranged, evenly balanced, and a worthy representative of its class. If it contains little that claims special attention, it is because the subject-matter is trite and not of a character to give play to originality.

There is, however, an air of conservatism about the statements that almost suggests that the book was not particularly needed, since what it says has been said so often before in a manner perhaps equally satisfactory.

J. B. R.

YELLOW FEVER: CLINICAL NOTES BY JUST TONATRE, M.D. (Paris), former Physician-in-Chief of the French Society Hospital, New Orleans; Member of the Board of Experts, Louisiana State Board of Health. Translated from the French by CHARLES CHASSAIGNAC, M.D., President New Orleans Polyclinic; Editor New Orleans Medical and Surgical Journal. Pp. xiv. 206. New Orleans: New Orleans Medical and Surgical Journal, Ltd., 1898.

THIS is a timely book, in that yellow fever at this critical period becomes a subject of practical interest not only to those whose medical

duties bring them in contact with troops occupying areas where this disease is endemic, but from the likelihood that it may be imported into this country. The work is divided into seven chapters devoted to (1) General Observations, (2) Symptomatology, (3) Charts of Pulse and Temperature in adults, (4) the same in children, (5) Diagnosis, (6) Prognosis, and (7) Treatment. The matters upon which the author lays stress are questions of accurate diagnosis, of which Fragel's law is frequently mentioned. This is the fall of pulse-rate during the first three days of the disease, and the divergence between pulse and temperature. As important, he considers the actuality of the occurrence of yellow fever in children, even those born in Louisiana. The observations, illustrated by thirty-five temperature-charts of adults and eleven of children, show the various modifications of the disease and are particularly instructive. His treatment is positive, sharply defined and yet simple. He insists upon absolute rest, aëration of the room, the keeping of careful records, and explicit directions to the nurse, placing especial stress upon the collection of the urine. During the congestive stage calomel as an antiseptic, a foot-bath *à la créole* (giving minute directions), cold baths or sponging. For the vomiting, rest for the stomach; for nourishment, starvation; for drink, Vichy (Celestin's). "What not to do" embraces quinine, digitalis, antipyretics, morphine, blisters, and cocaine. During the period of infection friction with hot vinegar, even hot baths, and subcutaneous injections of digitalis or caffeine. In prognosis he notes the observation of Fochier, to which allusion has been made in this JOURNAL, that recovery from septicæmia may take place after the formation of artificial abscesses, and suggests the subcutaneous injection of turpentine. For the future he has hope that the prophylactic and curative serum expected of Sanarelli will still further reduce the mortality.

We have mentioned the salient features of the book because it is not one of the ordinary. The author has enjoyed abundant opportunity during the nine epidemics of his thirty-three years of practice, and while accepting the latest and best of the results of the bacteriological laboratories, takes into consideration that the patient, his antecedent history, and present condition, have as much, if not more, influence upon the diagnosis upon which treatment is to be based. The text upon prognosis and prophylaxis should be carefully studied. He seems to fail in appreciation of the local water-supply, which he characterizes as "meat as well as drink" (p. 155). The book abounds in epigrams, some of which are quaint and have not lost in translation. Perhaps a fair example is this: In speaking of the disease, "Everything was congested at the outset, everything bleeds at the end" (p. 15). The translation from the unpublished manuscript of the author is, in the main, excellent, although some curious idiomatic expressions have crept in which by no means detract from the interest which the book excites. The author has departed from the beaten tracks and gives us the results of personal observations carefully and painstakingly made. His opinions are entitled to respect and his presentation to careful reading.

R. W. W.

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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A Study of the Lesions in a Case of Trauma of the Cervical Cord Simulating Syringomyelia.—J. H. LLOYD (*Brain*, p. 81) reports the anatomical findings in one of two cases of this kind, the clinical features of which were published four years ago. During life the patient gave the appearance of syringomyelia, but for reasons given in detail in the original Lloyd thought there might be inflammatory lesions (pachymeningitis hypertrophica) or perhaps necrosis. The autopsy was made five years after the principal injury. It showed old fractures of the cervical vertebræ, with deformity and callus, causing compression of the cord at the level of the third, fourth, and fifth vertebræ. Above the fourth and below the eighth cervical root there was nothing abnormal, externally, on the cord. There were thickenings of the dura at the third and fourth posterior roots, and there was a mass of fibrous tissue at the exit of the seventh root, around a spicule of bone. The brain showed nothing abnormal. The microscopic examination is described fully and should be read in the original. Briefly stated, there was an irregular area of degeneration in the usual position of syringomyelia, with corresponding ascending and descending degenerations. A large portion of the posterior columns, the anterior columns, and the columns of Türck escaped the lesion. In showing the similarity of position to the lesion in syringomyelia, the author raises the question of the relation of trauma to the latter disease, the case reported being separated from cavity-formation only by trifling stages. Less speculative are the remarks on the bearing of the case on the questions of sensory conduction in the cord. Tactile anæsthesia was present in the right foot and leg as high as the knee. It resembled the segmental anæsthesia so often found in hysteria, and the author thinks may have been of that kind. There was also hemianæsthesia to pain and temperature

in the side opposite to the main lesion and to the motor paralysis. This may be explained by believing with Van Gehuchten that the long fibres of the posterior columns, passing in by the posterior roots, serve for the conduction of tactile sensibility. These fibres pass up into the nuclei graciles and cuneati, and in the present case there is no evidence of degeneration of these fibres at or about their point of entrance into the nuclei. Van Gehuchten's view, that pain sense and the thermic sense are conducted through the gray matter by way of cells whose axis cylinders form part of Gowers's tracts, is also borne out by the conditions found, Gowers's tract and the direct cerebellar tract being degenerated on the side of the chief lesion all the way up. From these brief extracts the great value of the study made by Lloyd, and its importance to physiologists, as well as to clinicians and pathologists, can be easily seen.

Muscular Degeneration in Basedow's Disease.—ASKANAZY calls attention to a condition to which little attention has been paid. This is an atrophy of the voluntary muscles in Basedow's disease, with fatty infiltration. It was found in all the four cases examined by the author. The gross appearance was not unlike that in atrophy from non-use, but the distribution of the alteration in all the cases was such as to invalidate at once such an explanation. Of previous observers only Von Recklinghausen, Silcock and Bristowe, Farner and Haemig, and Hanau appear to have noticed the changes, but so uniform and striking were the lesions noted by Askanazy that it seems likely his results will be generally confirmed now that attention is called to them. The changes were always evident in the muscles usually exposed in autopsies, including those of the eyes, the tongue, and in one case in the pharynx and œsophagus, and to a less marked degree in the thigh muscles. The diaphragm was always intensely affected. The naked-eye changes were usually distinct. Beside the general wasting, the muscle-fibres become pale and difficult to distinguish from fat. The interstitial lipomatosis varies from microscopic infiltration to large masses running into the muscles. Microscopically the alterations are well brought out by methods which stain the fat, such as Marchi's. Fat granules are seen in long rows in the muscle fibres, which are narrow and their nuclei are increased in many places. The nuclei of the muscle cells also often show degenerations. The intramuscular nerves, the spinal cords, and brains showed no alteration of note, and none that could be associated with the atrophy. The heart muscle showed pigmentation, slight fatty degeneration, and more or less interstitial myocarditis, but was never affected like the voluntary muscles. The author rejects the views that the changes can be trophic or marantic, and looks on them as toxic. It is noteworthy that Langhans has recently shown the existence of a similar muscular degeneration in cretins, and in the same connection it is interesting to recall that Lemke suggested the existence of a muscle-poison in Basedow's disease. Mackenzie and Revilliod have also noted paraparesis in myxœdema. The clinical importance of the atrophy is obvious. Not only the marked weakness common in the disease, but also the tremor, may be readily explained, as was actually suggested by Mannheim in his recent monograph. Bryson's sign—diminished thoracic expansion—can readily be explained by the degeneration of the diaphragm, and the exophthalmos by that of the ocular muscles,

better than by any of the older theories. Askanazy gives a good account of the condition of the thyroid gland in his cases, showing, in common with other recent observers, that there is always an alteration of the gland, characterized by epithelial proliferation without increased colloid, in fact often without it. A short discussion of the theories of Basedow's disease ends the paper, the author naturally inclining to the view of Möbius, which, in fact, receives strong support from the observations made and the way in which they are utilized.—*Deutsches Archiv f. klin. Med.*, Bd. 61, p. 118.

The Alterations of the Blood at High Altitudes.—SCHAUHMANN and ROSENQUIST publish (*Zeitschrift f. klin. Med.*, Bd. 35, H. 1-2, 3-4) the results of an extensive series of observations, demonstrating that the changes in the blood observed on mountains are due to an increased production of red corpuscles. The chief proof is furnished by the occurrence of young nucleated cells in the blood of pigeons kept in rarefied air, beside an increase in the total number of corpuscles. A large number of observations are given proving the faultiness of other explanations, and the latter are criticised with great acumen. A copious bibliography assists in making this the most authoritative piece of work on the subject.

The Effects of Anterior Poliomyelitis on the Upper Nerve Centres.—PROBST adds another to the somewhat limited number of examinations on this subject (*Wiener klin. Wochenschrift*, 1898, No. 30). A man died at sixty-eight years, having had acute anterior poliomyelitis at four years. There was atrophy of the left arm and right leg. A history of long-continued pain and swelling in the extremities made it probable that the peripheral nerves also had been implicated. The brain showed atrophy of the central convolutions on both sides, more marked in the upper part on the right side. The left angular and marginal gyri were also less prominent than usual. Microscopically the cortex in these parts showed normal thickness, but all the cells were small, perhaps diminished in number, but well formed. The medullary rays were thin, the neuroglia of the outer cortical layer increased. In the internal capsules the fibres in the pyramidal tract were abnormally thin, but without signs of degeneration, and the further course of the pyramidal tract was atrophied. Cerebellum, pons, and corpora quadrigemina were small, the olivary bodies small but of the same size. Microscopically the cerebellum showed no alteration. The cord showed atrophy of the lateral pyramidal tracts, especially in the lumbar portion, with the usual alterations of an old poliomyelitis. Probst draws the conclusion that the formed but still developing brain is affected by the disappearance of the peripheral neuron, though not to as great an extent after poliomyelitis as after amputation; that the cerebellum is affected by infantile spinal paralysis through paths as yet unknown.

The Lactic-acid Bacillus of Oppler and Boas.—CARL STERNBERG has studied the biology of this organism, incited by a case in which an erroneous diagnosis of cancer of the stomach was based on the presence of the bacilli in the vomitus of a patient. The cultures from this, as well as those from a case of gastric cancer, showed a striking change of form under various conditions,

becoming shorter and thicker on solid media (glucose agar), longer and slenderer in maltose bouillon. The author thinks that the short forms may often exist in the stomach without exciting interest, but that, in consequence of chemical changes, either with cancerous growths or otherwise, they assume the longer and more striking forms.

Much less valuable than these suggestive experiments were some on the agglutination of the bacilli by the serum of inoculated guinea-pigs.—*Wiener klin. Wochenschr.*, 1898, No. 31.

Blood Color-tests and Iron in the Blood—JELLINEK (*Wiener klin. Wochenschr.*, 1898, Nos. 33 and 34) publishes the results of a careful and extensive series of observations on this subject. Among the points brought out by his work may be mentioned the confirmation of hæmoglobinæmia in chlorosis (red corpuscles in normal numbers). The chief result of the work was the confirmation of the view that the color-index of the blood as shown by such instruments as that of von Fleischl, even in the improved form devised by Miescher, is not always parallel with the amount of iron in the blood. The latter, he thinks, can be determined with sufficient accuracy for clinical purposes by the ferrometer of Jolles.

[In the latter instrument the iron in a measured quantity of blood is brought into solution and then compared with another solution of known composition. While it may be admitted that the ferrometer is a valuable addition to blood-diagnosis, it should at the same time be pointed out that it does not replace the older color-tests; and while it is more scientific in principle, it is important to remember that in order to give reliable results the instrument requires greater skill and also greater care than such instruments as that of von Fleischl.]

Balantidium-colitis.—DEHIO (*St. Petersburg. med. Wochenschr.*, 1898, No. 36) calls attention to the frequency of balantidium infection in Livonia, especially in persons who handle swine, stuff sausages, etc. He also makes an important contribution to the pathological anatomy of the disease. In one case, of long duration, the whole extent of the colon was the seat of ulcers, from 1 mm. to $\frac{3}{4}$ cm. in diameter, or sometimes confluent. The margins of the ulcers were sharp, and sometimes undermined, their floors reaching sometimes to the peritoneum; they were covered with necrotic masses. In another case the ulcers almost perforated the intestinal wall and a partly purulent, partly adhesive peritonitis was the immediate cause of death. In this case the parasites were alive when the body was opened, seventeen hours after death, the general opinion hitherto being that they cannot be found a few hours after the death of the host. In the third case the disease was of shorter duration than in the others and the only changes were those of a chronic inflammation with occasional hemorrhages and superficial erosions, but without ulcers. The results of treatment were very slight in all the cases.

Embolism of the Abdominal Aorta.—HEILIGENTHAL (*Deutsche med. Wochenschr.*, 1898, No. 33) reports an interesting case that came under his observation. The patient was a woman, forty-eight years old, who had been under the author's care for loss of compensation in mitral stenosis. Ten days

after leaving the hospital improved, while sitting down and cleaning clothes, the patient felt a most intense pain in both legs; the pain continued, varying in severity from moment to moment. Admitted at once to the hospital, the patient was excited and restless and cried out continually: "My legs, my legs!" The face was shrunken, the nose and extremities cool and cyanotic, the face and hands covered with sweat. The respiration was superficial, the pulse small, irregular, and too frequent to count. The heart-dulness was as before the attack, auscultation being impossible on account of the noisy breathing. The legs were blue and livid to the hips, and the color extended up the abdomen to a curved line, with the convexity downward, three finger-breadths below the umbilicus. Voluntary motion was impossible, but there was complete passive mobility of the legs. The patient had no knowledge of the position of the legs; reflexes and sensibility to touch and pain were abolished up to the line of Poupart's ligament. On opening a small vein little blood appeared; heat caused no reaction in the skin. The femoral and popliteal arteries did not pulsate. Urine drawn per catheter contained blood, albumin, and granular and epithelial casts. After a few hours the lightning pains subsided, the livid color disappeared, but the paralysis persisted. The patient became drowsy, waking at intervals, and died about half a day after the onset. The diagnosis of embolism of the abdominal aorta was confirmed at the autopsy, when a firm, non-adherent thrombus was found at the bifurcation, extending into both iliac arteries. The mitral valve was contracted, the heart muscle not palpably fibroid. It was remarkable that there were no thrombi in the left heart, and the author thinks that a clot formed there was thrown *in toto* into the aorta. In seven other cases in the literature, six with mitral stenosis, the left heart was free from thrombi. The author has been able to find altogether twenty-nine cases reported, and adds to the report of his own case some remarks on the symptoms, the formation of collateral circulation, and other pathological features. In two cases death did not follow the accident and the symptoms subsided considerably.

Smegma Bacilli in the Sputum in Gangrene of the Lung.—PAPPENHEIM (*Berliner klin. Wochenschr.*, 1898, No. 37) reports the case of a woman under treatment for diarrhoea and emaciation. Bothriocephalus eggs were found in the stools and three worms were expelled by treatment. The symptoms persisted. Signs of infiltration of the lower lobe of the right lung appeared, bacilli staining by the usual methods for tubercle bacilli were found in the sputum, and the diagnosis was changed to tuberculosis of the lungs and intestine. Three days after the discovery of the pulmonary dulness the patient died. Autopsy showed bronchiectasis, small gangrenous abscesses of the lung, and ulcerative enterocolitis. Examinations showed the complete absence of tuberculous lesions and proved that the bacilli belonged to the group of smegma bacilli. Since organisms of that class occur in the mouth, it is clear the patient had an aspiration pneumonia in which the bacilli were accidentally present. (Cultures from the lung gave staphylococci in large numbers.) Pappenheim made some attempts at a stain by which the smegma bacilli can be distinguished, and recommended for that purpose a method in which a solution of corallin in absolute alcohol, saturated with methylene-blue, is used to decolorize without acid. A. Fraenkel points out (*loc. cit.*, No. 40)

that he called attention some months ago to the presence of smegma bacilli in gangrene of the lungs, and notes some of the diagnostic difficulties met when tuberculosis is actually present in such cases. When he finds suspected tubercle bacilli in sputum rich in fat acids and myelin, he takes special precautions with the staining and makes animal inoculations.

[The report of Pappenheim, on its face, shows the danger of basing a diagnosis of tuberculosis on bacilli alone. Nothing is said about the other characteristics of the sputum, but it can hardly be doubted that it resembled that of gangrene rather than tuberculosis, while the clinical course and physical signs should have thrown suspicion on the diagnosis of tuberculosis.—ED.]

PÆDIATRICS.

UNDER THE CHARGE OF

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ASSISTED BY

THOMPSON S. WESTCOTT, M.D.,

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Albuminuria Accompanying Lithæmic Attacks.—RACHFORD (*Pædiatrics*, July 1, 1898), in a communication read before the American Pediatric Society, stated that the albuminuria in these cases could only be due to the irritation of the delicate kidney structures of the child, resulting from the attempt at elimination from the blood of the poisonous and irritating products which are the causes of lithæmic attacks. He has not infrequently found a small quantity of albumin in infants and children suffering from acute lithæmic attacks. He considers these cases analogous to the transient albuminurias which occur as a result of lithæmic paroxysms in later life. Auto-intoxication is responsible for this albuminuria either in early or late life. In middle and later life it is due to the arterio-sclerosis developed by this auto-intoxication; its prevalence in early life is due to the fact that the kidney at this time is more delicate in structure and less resistant. The comparative infrequency of lithæmic albuminuria in late childhood and early adult life is due, on the one hand, to the better developed and more resisting structure of the kidney, and, on the other, to the fact that the arterial changes found in old lithæmics have not yet had time to develop.

Two Cases of Mania during Measles.—FINKELSTEIN (*Wratch*, 1898, No. 20) reports two cases of this rare complication of measles occurring in his service at the Saint Nicholas Hospital.

1.—A boy, aged thirteen years, was admitted on the twenty-eighth day after the onset of measles. The psychic disturbance had existed since the twenty-first day; it was characterized by furious delirium, with periods of extreme terror. At admission there were acceleration of cardiac activity,

exaggeration of knee-jerks, and enfeeblement of nutrition. Intellection was slow, but questions were answered when repeated several times. There were hallucinations of sight of a terrifying character (a black man); he made efforts to escape, fighting with his hands and uttering loud cries. Sleep was agitated. This condition lasted for a week, and then gave place to gradual and complete recovery. The history showed that the father was an alcoholic, and that the child had been abandoned, and, finally, had been apprenticed in a shop where his life was very unhappy.

II.—The second patient was a girl, aged fourteen years, who showed mental disturbance from the time of the invasion of the disease, six days before admission to the hospital. The parents denied any heredity. During the first two days, while at home, the girl was sad and responded slowly to questions; the third day she showed signs of incoherence and hallucinatory confusion, manifested by dread of everything surrounding her. She cried out, threw away from her everything that came within her reach, and tried to run away. On admission to the hospital there was extreme exaltation and activity, preventing satisfactory examination; she cried out, striking with her fists; she did not answer questions, and repeated only the single word "injustice." She ran about the ward and threw everything away from her. She was very pale, and when examination of the chest could be made the vesicular murmur in both lungs was noted to be very harsh. Two days later the agitation was less violent and there was mental depression. Respiration was accelerated, and she seemed to have fever, but no thermometric record could be obtained. The next day the pharynx was observed to be reddened, and on the following day the eruption appeared. From this time on she became quieter, and two days later remained quietly in bed, occasionally mumbling to herself and not replying to questions. The heart was weak. Pneumonia developed and, with increasing feebleness of circulation, terminated in death six days after the appearance of the rash. The mind never cleared. No autopsy was permitted.

Intestinal Occlusion by Lumbricoids.—ROCHEBLAVE (*Annales de Médecine et Chirurgie infantiles*, August 1, 1898, p. 535) reports a case of intestinal obstruction in a girl, aged nine years. The symptoms had existed for four days previous to his visit, and had not yielded to repeated injections or to purgation, at first with fractional doses of calomel, later with repeated doses of castor-oil. The child complained of violent pain in the region of the transverse colon, which became more and more aggravated. Vomiting ensued and did not yield to opium, which also failed to relieve the pain. The abdomen was distended and excessively tender, but an area of dulness could be made out corresponding to the transverse colon, and a mass could be indistinctly felt. In view of the increasing gravity of the symptoms operation was determined upon, and a median incision made from the xiphoid cartilage to the umbilicus. The seat of obstruction was found in the transverse colon at the junction of the left and middle third, consisting of a plug giving to the examining finger the sensation of a bunch of packthread. Gentle manipulation succeeded in unrolling the mass and distinguishing three lumbricoid worms. With careful massage they were pushed along as far as possible toward the sigmoid. The abdominal incision was then closed.

Four hours after the operation the child felt completely relieved of pain, and vomiting had ceased. A spontaneous stool occurred, and an injection was followed by several abundant movements of the bowel, and appetite was re-established. On the third day a dose of 50 cgms. of calomel and 20 cgms. of santolin caused the expulsion of the three lumbricoids. The abdominal incision was completely healed on the eighth day.

Iodide of Arsenic in the Treatment of Lymphatic and Scrofulous Infants.—SAINT-PHILIPPE, of Bordeaux (*Annales de Médecine et Chirurgie infantiles*, August 15, 1898, p. 573), praises this drug very highly for a number of conditions in which lymphatism and scrofulosis are underlying causes. He mentions the following: In dermatitis, either moist, crusted, or itching, at any period of the disease or age of the child, but especially in children from six months to two and a half or three years, and when the lesion has passed its most acute stage; in interminable ophthalmias, with either phlyctenular keratitis or ulceration; in coryza, with swollen nose and enlarged and ulcerated lips; in naso-pharyngeal catarrh persisting after ablation of adenoid vegetations; in recurring bronchitis, with emphysema and violent crises of pseudo-asthma, where the tracheo-bronchial glands are certainly hyperæmic and enlarged; in chronic bronchitis; in enteritis without painful symptoms; in fetid diarrhœas; in abdominal enlargements, in which dyspepsia plays an important rôle; finally in helminthiasis, especially that due to the oxyuris vermicularis. He employs the anhydrous iodide of arsenic, which is a very stable compound and soluble in water. The solution of a strength of 1 to 100, prepared cold, is absolutely clear, of a slight greenish tint, and keeps indefinitely. It is given before meals, in a teaspoonful of either water or milk, sweetened; or, better, in older children, in a glass of water and wine. Five, ten, twenty, or even thirty drops a day may be given, ten drops containing about one centigramme of the drug. The commencing dose should be small.

Apart from individual susceptibility or special dyspeptic trouble, it is rare that this solution is not perfectly tolerated. Occasionally a little diarrhœa or loss of appetite may be noticed after a time, and rarely a little excitation or insomnia. It must then be suspended for a time. The author recommends that after increasing the dose gradually and keeping it at the maximum for a time, it is well gradually to decrease it to the commencing dose, and then to suspend it altogether for a few days.

Addison's Disease in the Child.—DEZIROT (*Thèse de Paris*, G. Steinheil, Paris, 1898) has collected fifty observations of this interesting disease in childhood. He finds that more uniformly in the child than in the adult Addison's disease is due to tuberculosis of the suprarenals. It is encountered at any age, even in the new-born. In its symptomatology, after asthenia and melanoderma, gastro-intestinal disturbance and convulsions are most common. The duration is relatively shorter in the infant than in the adult, and rapid or sudden death is a frequent termination. An accessory lesion often encountered is hypertrophy of the mesenteric ganglia and of the solitary and agminate glands. Treatment by orrhoterapy, up to the present time, has not given very satisfactory results.

Duration of Isolation of School-children for Contagious Diseases in Russia.—The Medical Council of the Russian Empire (*Revue Mensuelle des Maladies de l'Enfance*, August, 1898) has established the following periods of isolation for school-children who have been exposed to an infectious disease or have themselves suffered from such a disease :

Scarlatina: After exposure, and without development of symptoms, an isolation of twelve to fourteen days is required. A child that has been ill may be allowed to return to school six weeks after the appearance of eruption, provided there is after that time no trace of desquamation.

Measles: Fifteen days after exposure; or, in case the disease has been present, four weeks from the beginning of the eruption, if there is no trace of desquamation.

Rubella: Sixteen days; or after two weeks from the beginning of the eruption.

Varicella: Seventeen days; or after the fall of the crusts.

Pertussis: Fifteen to twenty days; or after six weeks from the beginning of the cough, if kinks have ceased and there is no expectoration.

Mumps: Twenty-two days; or after three weeks from the beginning of the parotid swelling.

Diphtheria: Seventeen days; or three weeks after recovery, and after the disappearance of hyperæmia of the pharynx, larynx, and nose; if bacteriological examination is possible, only after the disappearance of the bacilli.

Variola: Fourteen days; or after the fall of the crusts.

All convalescent patients should receive two or three warm baths at 35° C.

The Value of Koplik's Sign in the Early Diagnosis of Measles.—LIBMAN (*Medical Record*, June 11, 1898) has been able to confirm, by the examination of fifty morbillous patients, the diagnostic importance of the bluish-white spots upon the mucosa of the cheeks, signalized by Koplik as a constant phenomenon of the period of incubation. [See this department of THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, August, 1898, p. 248.]

One of these observations is particularly instructive as to the value of Koplik's sign in permitting early isolation of cases of measles in children's hospitals. The case was that of a boy, aged six years, who for three days had complained of cough, with fever and pains in the chest. At the time of admission he had no trace of coryza or conjunctivitis. There were only the signs of a slight bronchitis, with a mitral murmur and hypertrophy of the left ventricle. The temperature was 101.8° F. The diagnosis was at first doubtful, but the mouth revealed Koplik's sign. The child was at once isolated, and two days later the eruption appeared.

Since this experience Libman has made a point of daily examining the mouth of every patient in his service. A few days after this precaution was adopted he found the sign in another child, and later in nine others. These ten children were immediately isolated. All of them developed the eruption twenty-four to forty-eight hours later. On the other hand, no child failing to show the sign in the mouth subsequently developed measles. The author has never found the spots in other affections than measles. In a case of erythema nodosum and in one of tertiary syphilis somewhat similar spots

were observed, but they were clearly distinguishable by their larger size and by the absence of the zone of peripheral congestion.

Hospital Contagion of Pneumonia.—G. VARIOT (*Journal de Clinique et de Thérapeutique infantiles*, 1898, No. 13, p. 246) reports an apparently clear case of contagion.

Jean M. was admitted to the ward and placed in a bed beside that of Charles S., who was then just entering the acute stage of croupous pneumonia. Jean remained in the bed next to Charles during the whole course of the latter's disease, and eleven days after his admission, or six days after the defervescence of the disease in his neighbor, his temperature rose and he passed through an uneventful attack of the same malady.

This observation is by no means unique, similar cases having been recorded by Minot, Netter, and Comby. The author suggests that observations of this character, in which the dates are carefully noted, will enable one to determine the period of incubation of pneumonia. In such cases it is to be presumed that the transmission of germs has not been direct, but that the micro-organisms suspended in the dust or adhering to the bed-clothing have been the means of producing the disease. Netter, who has observed similar instances of contagion among adults, thinks that the direct transmission of germs should be rarer among young children, because they do not expectorate. It seems certain, however, that even if the child does not expectorate, like the adult, into a vessel, he coughs without any precaution, and in the paroxysms of cough must scatter minute portions of the pulmonary secretions upon his own or neighboring beds. It is also quite likely that during the course of the disease in Charles his neighbor came close to his bed.

SURGERY.

UNDER THE CHARGE OF

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Clinical Remarks on Stricture of the Urethra.—The following classification is one which HARRISON (*The Lancet*, April 23, 1898) uses for clinical purposes: First, those amenable to some form of dilatation; second, those found to be unadapted for such treatment, and where other measures should be considered; and third, those which may have been regarded as impassable strictures.

The first class includes by far the greatest number and all strictures in their early stages. When this process of treatment proceeds satisfactorily, as it usually does, the patient is soon able to undertake the management of his own case after he has been instructed in the use of the appropriate instrument. It is very easy to injure a stricture and so lose the way through it. On making an examination of this kind, the object should be to ascertain, without causing pain or bleeding, if possible (1) the presence and position of the obstruction, and (2) the degree of contraction which has been arrived at.

For this purpose the author prefers long, flexible bougies, twenty inches in length, which commence in a probe-point and gradually increase in size. They may be softened by placing them in warm water before use, and become so flexible that they will coil up in the bladder. Besides their use as exploratory instruments, he employs them to smooth out a rough urethra and make the access to a stricture funnel-shaped, so that it may be more easily entered. It is sometimes necessary to use filiform bougies to detect the entrance through the stricture. The long bougies ("whips") are useful in relieving retention of urine from a stricture that has contracted. The gradual dilatation produced persists sufficiently after the withdrawal of the instrument, so that the patient is able voluntarily to empty his bladder. They are very safe, as no force can be used with them, and the author believes they should be more generally employed.

The second class are cases that are not adapted to dilatation, as, for instance, those following wounds or injuries of the urethra. The difficulty may arise from the character of the scar tissue, its contractility, or there may be certain constitutional disturbances following attempts at dilatation of the gentlest kind.

These cases the author relieves by introducing a splice of new tissue into the floor of the stricture by internal urethrotomy, usually by Maisonneuve's instrument. As healing takes place under the occasional use of a bougie, a splice is formed of new tissue where the stricture was divided. For forty-eight hours or so before this is done it is well to sterilize the urine with some boric acid taken by the mouth, in small doses, or, as he has found better, boracite. The former sometimes produces indigestion, while the latter is both pleasant and reliable.

The filiform pilot is passed into the bladder, the fine metal director following it. The urethrotome is next run along the groove in the latter, and the strictures are divided from before backward. Care should be taken not to run the blade too far back and injure fibres of the sphincter, or excessive bleeding will be caused. A series of metal bulbous bougies (10-15, English gauge) should be passed successively before the patient recovers from the anæsthetic. All metal instruments for use in connection with a strictured urethra should be bulbous or olive-headed. The bladder is then emptied of any urine it may contain and washed out with a solution of perchloride of mercury (1 : 6000) until the lotion runs quite clear. An ounce or so is left behind in the bladder, so that the first urine voluntarily passed may be sterilized. Carbolyzed vaseline (three grains to two ounces) is used for the instruments. The author rarely ties a catheter in the bladder unless a chronic stricture has induced an atonic bladder, when a soft catheter may be

retained for forty-eight hours or so. On the fourth or fifth day a whip bougie is passed, and the patient is instructed in the use of a suitable instrument.

The third division, the impassable strictures, in the true sense of the word, are seldom encountered, for most of these, so-called, are but relatively impassable. In these cases the author uses Wheelhouse's operation with a staff, doing an external perineal urethrotomy.

The Pathology and Treatment of Rectal Strictures.—In discussing the questions whether there are such lesions as syphilitic stricture of the rectum, and whether it can be recognized by microscopical examination, RIEDER (*Arch. für klin. Chir.*, Band iv., S. 730) comes to the following conclusions:

Syphilitic stricture of the rectum does exist.

It arises from the bloodvessels (perhaps, also, from the lymphatics).

This origin is the cause of its relative frequency among women.

Concerning the venous involvement early in the disease, the author says it is of practical interest. If we see the veins of the skin filled with cellular infiltration, which probably is the bearer of syphilitic virus, if we see how newly formed and inflamed tissues press into the lumen of veins, then we can recognize not only that local, but that general dissemination of the disease may take place through this route, as was established years ago by Auspitz and Unna. We readily understand how the hard sore practically always occasions general infection, and how excision of the primary sore no more saves the patient than does the disinfection or excision of an infected sore preserve a patient from pyæmia once the necessary poison has gained access to the venous circulation. The reason why syphilitic stricture of the rectum is much more common in women than in men is found in the anatomy of the parts. In women the lower group of rectal veins anastomose directly with the external pudendal, which arise from the posterior vulvar commissure. This commissure is not rarely the site of a primary sore and of secondary, but more especially of tertiary, lesions. In the male the syphilitic poison, when taken up by the veins, has to take a roundabout course through the vesical plexus before it can go from the foreskin or glans to the rectal vessels. In women the syphilitic virus taken up by the vulvar plexus is at once carried into the hæmorrhoidal veins.

Tetanus Facialis Treated with Behring's Antitoxin.—ERDHEIM (*Wien. klin. Woch.*, May 12, 1898) reports two cases, one of which recovered, while the other died from tetanus facialis under treatment with antitoxic serum.

After reviewing the cases reported in literature, he says: We see that deaths and recoveries are equal in number, eleven of each. The number of cases is yet too small to draw from them any definite conclusions regarding the therapeutic value of this method of treatment, and it is desirable that all cases, whether successful or not, should be reported in order that sufficient statistics may be gathered from which to draw final conclusions.

This much, however, can be said: that any method of treatment that will reduce the percentage of mortality in these cases even a little is worth careful consideration.

Two Cases of Tetanus Successfully Treated with Antitoxin.—PATTERSON (*The Dublin Journal of Medical Science*, February, 1898) reports two cases of tetanus in which the symptoms became very alarming and where the use of antitoxin seemed to have been the cause of the ultimate recovery. The author says that he is aware that the cases are open to the obvious criticism that they belong to the type of tetanus which would recover if left to the *vis medicatrix naturæ* alone. But he answers that he has seen cases with no more pronounced symptoms rapidly run to a fatal termination, and one is not justified in standing idly by while a remedy full of promise lies ready at hand.

Whether the future will justify the hopes based on serum therapeutics can only be determined by a careful record of cases, and all should be reported, and in this direction lies at present our hope of combating some of the most terrible infective ills that humanity can ever suffer from.

Observations Upon the Etiology of Tumors.—With the continued investigations in the study of our so-called tumors, HARTLEY (*Annals of Surgery*, April, 1898) believes that surgery is destined to be relieved of the nomenclature and classification which we now employ, and that a classification in which the primary cause will be the criterion will place our tumors :

- (1) As the results of traumatism.
- (2) As the results of inflammatory processes, especially those followed by cicatrization and ulceration—*i. e.*, a local disturbance in the nutrition of a part.
- (3) As the result of congenital anomalies.
- (4) As the result of disturbances in nutrition, due to toxins, chemical or possibly parasitic, developed most frequently upon a soil prepared by traumatism, inflammation, or a sequestral anomaly.

Abdominal Section as a Medical Measure.—In a paper read before the Medical Society of London, TREVES (*British Medical Journal*, March 5, 1898) reviewed those cases in which surgical measures in abdominal disease appear to act upon the patient through other than accepted surgical lines. There are cases in which the mere opening of the abdominal cavity appears to effect, in spite of all surgical prejudices, either cure of a disease, or at least its temporary amelioration. Prominent among these conditions stands tuberculous peritonitis. The results of the treatment of this disease by simple incision have been little short of miraculous, and show a percentage of 69.8 of cures, of which number 33.4 per cent. may be regarded as complete. Another series of cases are those in which a mere incision into the peritoneal cavity has led to the rapid shrinking of certain malignant growths and to temporary improvement of the patient. Another group of instances in which relief unexpectedly followed abdominal section, with or without some further operative procedure, is illustrated by the large class of cases somewhat hopelessly styled nervous. These may be divided into two categories: those in which the symptoms of well-recognized diseases are imitated and those in which the clinical phenomena are simply bizarre and fantastic. Where the symptoms of some well-recognized disease are simulated operation for the disease and the removal of, for instance, a normal

appendix, brings about a cure. The other cases are numerous in which the patients suffer great distress, in which it is impossible to give any name to the disease or to offer any explanation of the symptoms. It has been demonstrated that a great many of these cases are relieved, and, indeed, cured by abdominal section after all medical measures have failed.

There is a somewhat more definite form of abdominal trouble that the author imagines may lay claim to the term "intestinal hypochondriasis." Many of the patients who are the victims of this condition are men, mostly of middle age. Nearly if not all have been the subjects of chronic colitis. They are apt to complain of fixed pain and tenderness at a spot a little below and to the left of the umbilicus. The spot indicated would not be far removed from the inferior mesenteric vessels and plexus. These patients suffer from troublesome constipation, from dyspeptic troubles, from sickening pain in the abdomen, and from indefinite depression. The whole mind is engrossed by the consideration of their bowels and the contemplation of the concerns of their abdomen. There is no doubt, from the study of these and similar cases, that the sigmoid flexure is a very irritable part of the alimentary canal. It is possible that, in these cases, long-continued catarrh has led to a permanent state of irritability of the muscle forming the bowel wall, to a condition of abiding spasm, which may well cause pain and the sensations of obstruction. Various distortions of the colon and sigmoid have been observed by the author, and gave rise to chronic constipation. Cases of idiopathic dilatation of the hollow viscera have been shown frequently to depend upon a stricture of their normal outlet, though they are often met with where no such condition is present. The term is too freely employed where a certain diagnosis has not been established.

The Operative Surgery of the Joints.—In regard to operation on the joints, MARSH (*British Medical Journal*, March 5, 1898) says there is an obvious parallel to be drawn between the joints and the abdomen in regard to the results that have followed the introduction of asepsis into surgical practice. It is certain that it is just as safe to open the knee, or any other joint, as it is to open the abdomen, and that, as in the case of the peritoneum, so in that of the synovial membranes, the old view that these structures are in some way inherently unsuitable for operative treatment is erroneous.

As an illustration of the truth of this statement, he relates the results which he has obtained in the open treatment of different joints for the various injuries. In operations for loose cartilages in the knee-joint he prefers their removal to suture, and in all of the twelve cases operated upon the functional result has been perfect and the recovery afebrile.

Loose bodies in the knee are also favorably operated upon, and in two recent cases which he reports extensive manipulation was extremely well borne, with a perfect recovery and complete restoration of function.

Suture of the patella represents a test-operation by the open method in recent or old fractures. The results obtained appear to show conclusively that this operation has taken its place on the list of recent advances in practical surgery, and the evidence it affords as to the tolerance by the joints of active interference is sufficiently conclusive.

The general safety with which excision of the joints can now be performed

is best illustrated by the results obtained in the case of the knee—the largest of the joints—and that in which an operation involves the most extensive wound of the soft parts, and the largest exposure of cancellous bone. Yet when care is taken to select appropriate cases, primary union after excision of the knee is as certain to take place as it is after ovariectomy or removal of the appendix.

Operation in sacro-iliac disease the author believes to be as free from danger under aseptic conditions as is operating on the other joints, and he holds that excellent results can be obtained even where the disease, in this particular region, has advanced to a considerable extent. He illustrates the results obtainable by the histories of five cases where operation produced gratifying results.

THERAPEUTICS.

UNDER THE CHARGE OF

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Locomotor Ataxia Treated with Strychnine Nitrate.—DR. EMIL ALTMAN reports a single instance in which, after increasing doses of Fowler's solution, spinal cord stretching, and static electricity had failed, this remedy was used. Strychnine nitrate, 1; glycerin, 240; water, 240, was the solution employed, hypodermatically. The initial dose was $\frac{1}{48}$ gr. (10 drops of the above solution), which was increased until a dose of $\frac{1}{8}$ gr. was reached; next, beginning with the initial doses, it was increased until $\frac{1}{4}$ gr. was attained. Again, starting with the initial dose it was doubled, and trebled, until $\frac{3}{8}$ gr. was taken at a dose. Under this treatment the pains did not return, the man could walk with the aid of a cane, and his general symptoms improved. Strychnine relieves some of the symptoms of the affection, and by nourishing the starved fibres of the cord prevents further progress of the disease.—*The Post-Graduate*, 1898, No. 7, p. 585.

Traumatic Tetanus.—MM. A. CHAUFFARD and QUÉNU report a successful instance of the intracerebral injection of antitoxin. Observation has shown that while antitetanic serotherapy is certainly preventive, it is often useless or inadequate when tetanus is well established. Roux and Borrel have explained this as follows: The nerve-cells have not the same affinity for antitoxin as for toxin. Also, tetanic antitoxin injected into animals remains in the blood, while toxin is extracted and fixed by the nerve-elements. The contra-poison does not come in contact with the poison; the two substances, although so close, do not meet. The serum is efficacious against the toxin when injected under the skin, because the greater portion of it passes into the blood, but it is powerless against the poison which has already reached

the nervous elements. For this reason, when tetanus is established it often fails. In the effort to antidote the toxin at the place of its manifest activity, the method of intracerebral injection was chosen. A boy of sixteen was injured (two fingers of the left hand). Fourteen days after, tetanus appeared and rapidly became severe. On the fifth day of the disease an incision was made in each temple, the skull trephined, and from one-third to one-half drachm of concentrated serum was slowly injected to a depth of two inches through a needle. The injection was intended to reach the base of the second frontal convolution, to spare the psychomotor centres, and not risk producing any material disorder, but at the same time to be sufficiently near, so that they should be reached in the diffusion of the antitoxin. The cerebral tissues bore the injection well. As for the grave symptoms, due to the disease, these gave rise to great anxiety for the following six days. On the seventh day after the operation, for the first time the patient slept the greater part of the night. Two days later the improvement was noticeable, but not until seventeen days after the operation could the mouth be freely opened and the patient chew food. Finally complete cure was established, and no trace of cerebral lesion followed this procedure.—*La Presse Médicale*, 1898, No. 51, p. 325.

The Oily Collyria.—DR. PANAS, on account of difficulties in rendering ointments aseptic, and in making applications of the same to the eye, has chosen in their place oily solutions which can be preserved in glass-stoppered bottles. Since the salts of atropine, physostigmine, pilocarpine, and cocaine are soluble with difficulty in oil, their bases are employed in the following strengths: 1 per cent. for atropine and physostigmine, $1\frac{1}{2}$ for pilocarpine, and 2 per cent. for cocaine. For the solutions olive or peanut oil is employed. These are freed from free fatty acids by washing with 90 per cent. alcohol and sterilized by heating to 248° F. After the oil is cooled to 140° F. the organic base is added. For physostigmine a solution in ether is made, and this is added to the oil at a temperature not higher than 113° F. These solutions, exposed to light and air, have remained unchanged for months. Indeed, the physostigmine, which in an aqueous collyrium quickly becomes reddened, retains its amber-yellow color when dissolved in oil. The oil apparently has a sterilizing influence, for the spores which it may contain do not develop, nor do the micro-organisms increase. Experiments have shown that the oily atropine and cocaine collyria act better than the watery, and, with the exception of a slight hyperæmia, which disappears after a few minutes, show their physiological action. An important property of this cocaine preparation is that it has no influence upon the corneal epithelium, while the watery solution has. Since this is the chief disadvantage of this substance, the advance attained in the substitution of oily solutions is readily apparent. The absolute asepsis of these collyria is so assured that they can be applied by small glass spatulas, which can be dried and thoroughly heated after use. Note is also made that castor-oil has also been recommended, in fact was the first to be used for this purpose.—*Klinisch-therapeutische Wochenschrift*, 1898, No. 28, S. 1023.

[Castor-oil so frequently irritates the conjunctiva that its use has been very properly abandoned.—R. W. W.]

The Use of Ichthyol in Diseases of the Eye.—DR. M. EBERSON makes use of a 30 to 50 per cent. aqueous solution to which a small percentage of glycerin is added, and of a 5 per cent. ointment. Fifteen instances of its use are reported. The conclusions are: (1) That it is a sure remedy for the cure of trachoma in that the course of the disease is shortened and the surfaces become smooth. (2) That this method is especially to be recommended for children. (3) That it quickly cures catarrhal conjunctivitis with or without corneal complications. (4) That it is a powerful remedy for clearing up corneal scars.—*Klinisch-therapeutische Wochenschrift*, 1898, No. 18, S. 669.

The Treatment of Gonorrhœa.—DR. PAUL NOGUÈS states that protargol (silver proteinate) is not irritating, so that injections of its solution can be made so soon as the patient presents himself. Three are given each day; the morning and afternoon injection should be retained five minutes, the evening, thirty. Since it is tiresome to keep the urethra closed with the fingers for this one injection of a half-hour's duration, six, of five minutes each, are substituted. After a few days the evening injection only is necessary, and this should be continued for three or four weeks. A syringe of at least four drachms capacity should be chosen. The strength of the solution is from 0.25 to 0.50, and later to 1 per cent. Of fifteen patients under observation four presented themselves before the inflammatory symptoms were declared, and in these the treatment was abortive, and all were cured. Four appeared during the acute stage; of these three were cured. The remaining seven came under observation during the decline of the discharge, and all were cured. The injections did not cause pain nor other disturbance, save that strong solutions produced complaint of some rectal discomfort and a desire to urinate. The duration of the treatment varied from six to thirty-six days; the average is twenty-one, which may be further reduced to twelve or fifteen. The harmlessness of the remedy leads to the hope that it may be successfully employed in retro-injections and irrigations.—*Annales des Maladies des Organes Génito-Urinaires*, 1898, No. 6, p. 569.

DR. SALOSCHIN reports upon the use of this substance in the gonorrhœa of women. For eight instances of acute disease it was applied in 5 per cent. solution through a speculum to the cervical canal, the vagina treated with a 2 per cent. solution, and a tampon moistened in the first-named solution left in position. In the subacute variety, and especially complicated with cystitis, irrigation of the bladder with a $\frac{1}{2}$ to 1 per cent. solution gave variable results in ambulant patients. Some were markedly improved; in others betterment could not be declared, and in some the treatment was not effective in preventing a recrudescence of the disease. The general conclusion is reached that the remedy is likely to be serviceable in this disease.—*Klinisch-therapeutische Wochenschrift*, 1898, No. 25, S. 929.

Protargol in Genito-urinary Therapeutics.—DR. PAUL GUILLON employs a 2 *per mille* solution for vesical irrigation, and finds that it is a complete disinfectant. For gonorrhœa in its various stages, whether used in injections, by irrigation without catheter or with special instruments, or in instillations, the same results are obtained as with potassium permanganate or silver nitrate,

perhaps a little less rapidly, but surely and with less local reaction, less recrudescence of the discharge during the first hours after its use, and particularly with no painful sensations before or after treatment. This is especially to be considered in instillations. A small detail of importance is that it does not stain the fingers of the surgeon nor the linen of the patient.—*Revue de Thérapeutique Médico-chirurgicale*, 1898, No. 14, p. 473.

The Treatment of Nephritis Hæmorrhagica.—DR. A. KRAMER reports four instances of the use of methylene [not methyl] blue in dose of one and one-half grains thrice daily. The cause assigned for the appearance of the symptom was "chilling." After the use of this remedy there followed a rapid and complete disappearance of the blood from the urine. There was also observed a marked diminution in the amount of albumin and an improvement in the general condition. This effect upon albumin has been previously noticed by Netschajew, Lemoine, and, in pyelitis, by Dehio. The suggestion is made that possibly this substance may serve for making a differential diagnosis between this condition and hemorrhage due to carcinoma or tuberculosis.—*St. Petersburger medicinische Wochenschrift*, 1898, No. 20, S. 186.

A New Preparation of Quinine for Hypodermatic Use.—DR. G. GAGLIO mixes 2 parts of quinine hydrochlorate or hydrobromate with 1 part of urethane and dissolves the mixture in 1 part of warm water. This gives a stable solution, permanent when cold, of a neutral reaction, and non-irritant. A new chemical compound is formed, because in treating this solution with ether the urethane cannot be extracted nor the quinine precipitated. In the organism quinine is liberated, which produces its usual physiological effects. As for the urethane in the dose employed, it has no action capable of interfering with that of quinine.—*Les Nouveaux Remèdes*, 1898, No. 13, p. 312.

Hæmatemesis and Melæna Neonatorum; Treatment by Calcium Chloride.—DR. L. A. PARRY reports a simple instance of the successful use of this remedy. Five-grain doses were given frequently, so that 160 grains were taken in three days. The hemorrhage began to lessen in twenty-four and ceased entirely in forty-eight hours.—*The Lancet*, 1898, No. 3907, p. 144.

Infantile Diarrhœa Treated by Endoxine.—DR. M. ELEZARIAN recommends this preparation, which contains 52.9 per cent. of iodine and 14.5 per cent. of bismuth, as efficient in the treatment of this condition. The active ingredient is the iodine, which is disinfectant and astringent as well as an alterative to mucous membranes. The remedy is harmless, and can be administered in dose of one grain every hour to a child a year old without any alarming results.—*New York Medical Journal*, 1898, No. 1029, p. 270.

The Chemistry of Aloes.—DR. ALFRED R. L. DOHME concludes that (1) Curacao aloes are as efficient as and, being much cheaper, should be preferred to Socotrine aloes; the greater portion of the latter as sold to-day is made up of the former. (2) The resin of aloes is an ether or organic salt, and varies according to the kind of aloes and the varying constituents of the acid, the

alcoholic constituent being aloresinotannol, and being the same in both Barbadoes and Cape aloes, the only specimens thus far examined. (3) Aloin contains emodin, to which its laxative properties are probably due. (4) Many laxative drugs, beside aloes, such as senna, cascara sagrada, rhubarb, buckthorn bark, owe their laxative property to this substance, emodin, or some substance like it, derived from anthraquinone, and homologous or isomeric with it.—*American Journal of Pharmacy*, 1898, No. 8, p. 398.

The Action of Coronilla Varia Upon the Heart.—DR. V. POULET makes use of an aqueous extract which has given satisfaction, as has also a powder of the fresh plant (flowers and leaves) made into pills, each containing one and one-half grains. After reporting three instances of its use, he concludes: (1) That it is an excellent remedy for cardiac disease in that it regulates a disordered rhythm, slows too rapid beats, relieves tachycardia, and shows its efficiency in the period of asystole. (2) At the same time it acts favorably upon the functions of the digestive system, and is superior to digitalis, which often is badly borne and causes vomiting and diarrhoea, unfortunate phenomena which oblige the physician to abandon its use. (3) It is especially adapted to those diseases of the heart which occur with gastric disorders, if the former are reflex phenomena of the latter. (4) It acts favorably when the disease of the heart produces a cerebral syndrome characterized by more or less violent vertigo. (5) It has the marked advantage of being non-cumulative, so that its use can be indefinitely prolonged. (6) It is a more trustworthy diuretic than most of the remedies of similar action, such as strophanthus and sparteine, but in this respect it is inferior to digitalis. However, this may be remedied by a combination of the two drugs. (7) Finally, it succeeds when other heart remedies have failed: strophanthus, sparteine, and even digitalis. Whether it will prove useful in Corrigan's disease must be determined by further experimentation.—*Les Nouveaux Remèdes*, 1898, No. 13, p. 289.

Abdominal Massage in Cardiac Diseases.—M. HUCHARD, reporting upon the paper of Cambru, recognizes the fact that in these diseases there exists a stasis in the mesenteric veins and in all the abdominal venous system. Often this plethora exists for a long time before the outbreak of the accidents of asystole. If, then, the intra-abdominal circulation is improved by massage, the renal tension can be increased and the blood-current quickened. Under these conditions an abundant diuresis, analogous to that of digitalis, can be obtained.—*La Médecine Moderne*, 1898, No. 56, p. 447.

The Danger of Carbolic Acid with Children.—M. COMBY reports an instance of a girl of five years for whom a specialist had ordered injections into the ear, six times daily, of a 1.5 per cent. solution. Each evening, after the last injection, five drops of a 1.5 per cent. solution of carbolic acid in glycerin were used, followed by a tampon of absorbent cotton. This treatment was carried out for ten days, when the otitis was cured. Two days after the cessation of the treatment hæmaturia with headache, but without fever, appeared. Investigation excluded all causes of hæmaturia save the carbolic acid. Recovery followed after a milk diet and rest in bed for three weeks.—*La Médecine Moderne*, 1898, No. 56, p. 447.

OBSTETRICS.

UNDER THE CHARGE OF

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Case of Puerperal Infection in which the Bacillus Typhosus was Found in the Uterus.—In the *American Journal of Obstetrics*, August, 1898, DOBBIN reports, in a very complete manner, an interesting case of puerperal infection in which the bacillus of typhoid was present within the womb. By reference to the literature, he finds that the streptococcus pyogenes, staphylococcus (aureus and albus), bacillus coli communis, gonococcus, bacillus of tetanus, Klebs-Löffler bacillus of diphtheria, diplococcus pneumoniae of Fränkel, bacillus proteus, bacillus aerogenes capsulatus, and the anaerobic gas producer of Lindenthal, have been demonstrated to be present in cases of puerperal infection. Until his own report, there have been no positive demonstrations of the presence of the bacillus of typhoid in the womb.

His patient was a young woman who was delivered in her third labor by a midwife. Clots and pieces of placenta were retained, and were removed by a physician on the second day. The patient had fever when admitted to the Johns Hopkins Maternity Ward. Her previous history was that her husband had died with fever, possibly typhoid, about a month before her confinement. She had nursed him and had been perfectly well until she came into labor. On examination there was an eruption on the abdomen which might readily have been caused by typhoid infection. Lochia from the uterus was removed for examination, and afterward the womb was washed out with salt solution. As streptococci, with other germs, were found in the lochia, an injection of serum was given. There was a rapid rise of temperature, followed by a fall and a diagnosis of pyæmia was made. Cultures made from the blood were sterile, but the Widal reaction was positive. The urine gave a marked diazo-reaction. An abscess which contained streptococci formed on the left leg.

On examination the uterine lochia, in addition to other germs, showed distinct cultures of the bacillus typhosus. The child died on the second day and its body was not subjected to examination. The mother recovered.

There are two explanations for this case. One, that of infection through the medium of the midwife; and the other, infection of the blood-stream with the bacillus typhosus, with the passage of the germ from the blood into the uterus. The author inclines to believe that the case was one of mixed puerperal infection, arising through contamination from without.

Fibromyoma of the Uterus and its Influence upon Sterility.—In the *Monatsschrift für Geburtshülfe und Gynäkologie*, Band viii., Heft 2, 1898,

FRÄNKEL contributes a paper upon this subject. He reviews at length the paper of Hofmeier, who concluded that cases of sterility in women who had fibromyomas were due more to other conditions than to the tumors. He differs with Hofmeier and with those who have adopted his view, and finds evidence that fibromyomatous tumors distinctly predispose to sterility. He shows, by computing the average birth-rate of Germany and then the birth-rate of these cases, that more than one-third of the patients having these tumors have during their married life but one child, while in a series of 2000 cases of women who had other pelvic diseases, but 5 per cent. show the same comparative sterility. He believes that interstitial tumors have the greatest influence in preventing conception. Next in importance are subserous, while least effective are submucous.

He does not attempt to define clearly the way in which this causal relation is brought about, nor does he pretend to say definitely whether the myomatous tumor is the cause of the sterility or whether the sterility and conditions causing it produce the tumor.

The Practical Significance of Bacteria Found in the Vagina.—In the *American Journal of Obstetrics* for October, 1898, WILLIAMS publishes a paper read before the American Gynecological Society at its last meeting. His results were obtained by the bacteriological examination of the vaginal secretion in ninety-two pregnant women. His conclusions are as follows:

He did not find the usual pyogenic cocci in the vaginal secretion of these patients. But twice in ninety-two cases the white staphylococcus often found in the skin was present. He considers auto-infection impossible. The gonococcus is occasionally found in the vaginal secretion, and may extend into the uterus and tubes during the puerperal state. While it has not been demonstrated, it is possible that the vagina may contain bacteria which may give rise to sapræmia and putrefactive endometritis by auto-infection. Death from puerperal infection is caused by infection from without, and usually follows the neglect of aseptic precautions by doctor or nurse. Such infection may best be avoided by limiting vaginal examinations as much as possible. When such are made, the external genitals should be cleansed and disinfected carefully, and the hands rendered as aseptic as if for a laparotomy. Vaginal douches are not necessary and are probably harmful.

Sagittal Fontanelle in the Heads of Infants at Birth.—LEA contributes to the *Transactions of the Obstetrical Society of London*, 1898, vol. xl., Part iii., a paper upon this subject in which he draws the following conclusions:

The sagittal or parietal fontanelle is present in 4.4 per cent. of infants at birth. It is usually bilateral and lozenge-shaped (76 per cent.), more rarely it is unilateral and triangular (24 per cent.). It closes within the first two months of life, but at times may remain open for at least eight months after birth, and possibly longer. It is frequently associated with deficient ossification of the posterior parts of the parietal bones. Its presence does not appear to be associated with any constitutional condition of the infant or the mother. During delivery it may lead to error or confusion in diagnosing the presentation. It is probably of some use in facilitating the moulding of the head in vertex presentations. It may simulate fracture or injury of the skull.

Pernicious Nausea and Vomiting of Pregnancy.—In the *Zeitschrift f. Geburtshülfe und Gynäkologie*, 1898, Band 39, Heft 1, KLEIN contributes a paper upon this subject, based upon a study of cases observed in the clinic at Munich. He believes, with other observers, that only those cases are to be considered as pernicious vomiting in which the nourishment of mother or child is profoundly influenced and in which the disorder persists. He thinks many cases are distinctly neurotic and some are hysterical. The milder cases recover under careful feeding and proper discipline. Should in any case treatment at the patient's home not be promptly effective, the physician should at once insist upon placing the patient in a hospital. In all cases the retroflexed uterus should be replaced, although he has not seen brilliant results from the use of drugs or other local treatment. When cases are severe it may be necessary to interrupt the pregnancy. It is of especial importance that these cases should not be allowed to become severe.

Grippe as a Complication of Pregnancy and the Puerperal State.—In *L'Obstétrique*, 1898, No. 3, BAR and BOULLÉ report their observations upon fifty women who had grippe during pregnancy or the puerperal state.

In pregnancy, grippe affected the nervous system profoundly in one case, the gastro-intestinal tract in two others, while in the majority the respiratory organs were attacked. In one of the intestinal cases, pyelitis developed, caused by infection with the colon bacillus. The majority of pregnant women in whom grippe affected the respiratory organs recovered without especial difficulty. A small number had pneumonia, which proved a serious complication. In one patient otitis and meningitis developed, both caused by the pneumococcus. The sputum of these patients showed abundant pneumococci.

So far as the influence of grippe on the continuation of pregnancy was observed but a very few cases had metrorrhagia. Labor itself was not especially influenced by grippe. In one case in which the delivery was artificial a severe hemorrhage occurred. The placenta in these cases was found to be normal.

In the puerperal condition, grippe sometimes occasioned severe complications. Mixed infection with streptococci occurred in some cases, and in one proved fatal. In several patients pulmonary infection with the pneumococcus and genital infection with the streptococcus were present in the same patient. It was observed that mixed infections were especially severe; thus, in one case of pneumonia in the puerperal state, there was phlebitis of the external jugular and cephalic veins, in another case the pulmonary lesions were accompanied by endocarditis.

Incarcerated Ovarian Dermoid Complicating Pregnancy.—SPENCER describes, in the *Transactions of the Obstetrical Society of London*, 1898, vol. xl., Part iii., the case of a multipara, who on admission to the hospital was found to be in about the middle of pregnancy. The cervix was high up and pushed forward by a tumor the size of the fist. The tumor lay in front of the rectum and could not be easily moved; under an anæsthetic it was possible to push it up out of the pelvis. It then lay in the left hypochondrium.

The patient was four and a half months pregnant, and accordingly it was

thought best to allow the pregnancy to go on to full term and to remove the tumor after delivery. The patient wore an abdominal binder during the rest of the pregnancy, and had no recurrence of the pain from which she suffered while the tumor was in the pelvis.

She was confined in the hospital and had a normal delivery and recovered from labor. Fifteen days after delivery the abdomen was opened and the tumor, an ovarian dermoid, was removed. Its pedicle was twisted. The patient made a good recovery and nursed her child.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF
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Lepra of the Larynx.—In the *Proceedings of the Laryngological Society of London*, March 9, 1898, a case of tuberculous lepra of the larynx, mouth, and nose is reported and illustrated as occurring in the practice of DR. PAUL BERGENGRÜN, and communicated by PROF. A. A. KANTHACK, who demonstrated a complete series of colored photographs and drawings illustrating the macroscopic and microscopic appearances of the leprous lesions and the laryngoscopic images.

The disease involved the larynx, tongue, uvula, posterior palatine folds, hard and soft palate, gums, and the nose.

Extreme Mobility of the Tongue.—ARSLAN (*Il Morgagni*, 1897; *Annales des Maladies de l'Oreille, du Larynx, etc.*, July, 1898) reports one of those rare instances of abnormal physiological mobility of the tongue. In the present case the subject is able to carry the point behind the palate into the rhinopharynx and introduce it into either one or other of the choanæ, whence it could be seen on examination of the nasal passage anteriorly.

Oropharyngeal Mycosis.—DR. R. P. LINCOLN read a paper on this subject before the Harvard Medical Society of New York, March 26, 1898, which was published in the *Medical News*, April 30, 1898. In his treatment he relies upon the electric cautery and pyoctanin. If the points of disease are few and favorably located, as on the tonsil, they are to be excised and the trouble at once eradicated.

In using the pyoctanin, the pure powder is rubbed thoroughly for several minutes upon and into the lacunæ, the process being repeated at short intervals, daily for awhile, until the reappearance of the growth ceases.

Resection of the Nasal Septum.—M. ESCAT (*New York Medical Journal*, July 2, 1898, from *Gazette hebdomadaire de Médecine et de Chirurgie*, May 26th)

described to the French Society of Otology, Rhinology, and Laryngology a simple method of resecting the nasal septum without danger of perforating the partition, by a procedure described as being very easy of execution, not painful, and exceedingly rapid. He places in each nostril a tampon of absorbent cotton saturated in 10 per cent. cocaine solution, one on the concavity and one on the convexity of the septum. When anaesthesia is attained he removes the two tampons simultaneously, injects, with a hypodermatic syringe holding about forty-five minims, that amount of boiled water, or as much as is requisite, under the mucous membrane on the concave side, thus stripping the mucous membrane from the cartilage. Then, through the other nostril he resects the cartilaginous arch with a bistoury in a vertical direction, and tampons the resected side. The result is excellent. After cicatrization the closure is insured by the approximation of the uninjured membrane of one side with the cicatrized membrane of the other.

[This means of protecting the membrane from injury is certainly very ingenious, and if the operation is found as efficient as is claimed in this notice, it will probably supersede former procedures.—Ed.]

Rapid Extirpation, Without Osseous Resection, of Large Rhino-Pharyngeal Polyps With Extracranial Prolongations.—ISCHWALL (*Congrès français de Chirurgie*, October, 1897; *Annales des Maladies de l'Oreille, du Larynx, etc.*, July, 1898) reports the case of a boy, aged thirteen years, with a voluminous rhino-pharyngeal polyp with prolongations in the maxillary sinus and in the temporal fossa of the right orbit. The patient being in the Rose position—pendent head—the base of the polyp was detached with the rasp, and the tumor was seized in the pharynx and brought forward. The right index-finger, introduced into the right nasal passage, liberated it from the pterygo-maxillary fossa, and all the rhino-pharyngeal portion was extracted through the mouth without the necessity of disturbing the skeleton. An incision practised in the temporal region permitted seizure and rapid tearing away of the remainder of the tumor. The success of this method of intervention depends upon the rapidity of operation, the hemorrhage being considerable.

Œsophagotomy for Foreign Body in the Œsophagus.—DR. JOHN O. ROE, of Rochester, reports (*Journal American Medical Association*, 1898, No. 13) an œsophagotomy for the removal of a tooth-plate impacted five days in the upper third of the œsophagus in a man aged sixty-six years. There was some ulceration of the œsophagus where the tooth-plate had been embedded, with considerable sloughing of the inner wall of the side opposite to that in which the incision had been made. The patient did well for four days, when congestion of the lungs supervened, and he died the following morning.

Case of Urticaria Involving the Uvula and Nearly Causing Asphyxia.—DR. GUY HINSDALE, of Philadelphia, reports (*Philadelphia Polyclinic*, July 30, 1898) the case of a gentleman, aged twenty-five years, with painful urticaria, husky voice, difficult breathing, puffy eyelids, and swollen nose. The uvula was œdematous, but the larynx and epiglottis were not involved. With applications of cocaine, Seiler's solution in spray, and additional

cocaine, his symptoms were relieved; and, under the continuous use of the atomizer, large doses of rhubarb and soda, and abundant use of the extract of witch-hazel externally, he was able to return to business the following morning.

OPHTHALMOLOGY.

UNDER THE CHARGE OF

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Phlyctenular Conjunctivitis.—H. HERBERT (Bombay), writing of this disease as it has occurred in India, states that about one-third of the cases that are seen there show clear evidences of chronic conjunctivitis. A smaller percentage, which he classifies as eczematous, present phlyctenules associated with general acute or subacute primary conjunctivitis, the eruption being a more or less accidental complication. In eleven cases out of one hundred the phlyctenules occurred on the palpebral conjunctiva, which was uniformly thickened, reddened, and usually roughened. In most such cases there were also phlyctenules on the bulbar conjunctiva. On the lid the phlyctenules were more commonly multiple than single, and their favorite seat was just within the lid-border; they tended to spread here in a line. They were more common on the upper lid than on the lower. Occasionally two or three were joined together into an irregular conglomerate infiltration. Their characteristic acute course and nearly invariable association with similar lesions on the bulbar membrane are sufficient for diagnosis.

He notices also the large proportion of adults affected with this disease in India. More than one-third of the patients were over twenty years of age, and a few scattered cases over fifty.—*Ophthalmic Review*, March, 1898.

Galvano-cautery for Detached Retina.—J. O. STILLSON (Indianapolis) reports five cases in which he resorted to multiple puncture of the sclerotic with the galvano-cautery, with four recoveries and one negative result.

He was led to try this measure by noticing that after incision of the sclera the subretinal fluid was usually not entirely evacuated, and always tended to reaccumulate. He thought this could be prevented if a wound were made which would not close so quickly. The diagnosis as to the location and size of the detachment is to be made by examination in the upright image. The head is to be tilted to one side and then to the other until the most dependent portion is determined; this is the location for the first puncture. The second is made in or near the edge of the detachment, if it be

large, or even well in it; usually not in the sound retina, when the detachment is small, and yet far enough away to get the beneficial effect of a vent. The further object of the two punctures is to avoid making the one so large and to facilitate gradual and prolonged filtration of the fluid out of the sub-retinal space. The openings are made with the galvano-cautery plunged in directly at right angles to the sclerotic, and not in such a way as to form a valve. The point, while white or red, should be held a moment in place without turning off the current, and gradually withdrawn. This burns a round hole which will not close as rapidly as one made with a knife or otherwise. He has seen it remain open six or eight weeks, in one case ten.

The new exudate will escape as fast as it is formed; usually the retina attaches itself at the periphery first, and lastly at the point of puncture. The reaction is never violent.

In none of the successful cases had the detachment lasted more than ten months. In the unsuccessful one the detachment had occurred with hemorrhage two years before it was treated.—*American Journal of Ophthalmology*, May, 1898.

Opacity of the Cornea.—G. A. BERRY (Edinburgh) recommends for the treatment of opacities of the cornea due to recent exudation massage of the cornea. This is best done through the lid. The lid is rubbed quickly and with gradually increasing force over the cornea for half a minute or more at a time, once or twice daily. To do this effectually the rubbing must give rise to a moderate degree of surrounding hyperæmia. The massage may be combined with the use of iodine ointment. Or a good, and not too strong, stimulating effect may be secured by the daily use of the following prescription:

R.—Olei terebinth. 3j.
 Olei amygd. 3ij.

Sig.—Eye-drops.

—*Edinburgh Medical Journal*, April, 1898.

Orbital Cyst.—W. KLINGELHOFFER (Mannheim) reports the extirpation of a cyst from the orbit of a child, nine months old, by the method of Kronlein, which consists in temporary resection of the outer wall of the orbit. A careful incision was made, with its apex reaching the middle of the outer wall of the orbit, dividing the tissues down to the periosteum. The frontal and malar bones were chiselled toward the intra-orbital fissure and the included fragment displaced outward. In attempting to remove the cyst hemorrhage occurred, and it was opened. The cyst-wall was removed as far as possible, and two days later the remainder of the sac, which was firmly attached to the orbital fissure, was removed. The resected portion of the bone was then replaced, and the patient discharged well after two weeks. More than a year later examination of the child showed the eye markedly convergent, the pupil dilated and fixed, and the optic nerve pale, although the eye appeared to have some vision.—*Archives of Ophthalmology*, 1898, No. 1.

[When it is remembered that the chief claim of Kronlein's operation is that it is capable of effecting the removal of a tumor with the least disturbance to the eyeball and its accessory organs, the final result of this case

scarcely seems to justify such a serious mutilation of sound tissue, especially when we bear in mind the great recuperative power of such a young child and the comparative accessibility of the depths of the orbit through the conjunctival space at that age.—E. J.]

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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Disinfection with Formaldehyde.—The conclusions arrived at by Drs. WILLIAM H. PARK and ARTHUR R. GUERARD (*Philadelphia Medical Journal*, September 10 and 17, 1898), based on a series of experiments with formaldehyde in its various forms and with the several methods recommended for its dissemination, are that dwellings may be superficially disinfected when all apertures are tightly closed and the agent is employed in the proportion of not less than 1 per cent. volume strength; with exposure of not less than two hours and a temperature not below 52° F., all common non-sporebearing pathogenic bacteria are quickly destroyed when freely exposed, but spore-bearers, such as anthrax bacilli, require at least twice as much of the gas; that the penetrative power of the gas is extremely limited, even under the most favorable conditions; that bedding, carpets, and the like, require special treatment; that the most delicate colors and fabrics, furs, leather, and other articles which are injured by steam and hot air and other disinfectants, are unaffected by formaldehyde; that books may be satisfactorily disinfected in a special apparatus when arranged to stand as widely open as possible on perforated wire shelves, but not elsewhere or under other conditions; that the bindings, illustrations, and print of books are in no way affected by the action of the gas; that the agent is superior to sulphur dioxide as a disinfectant because of its greater efficiency and rapidity of action, of its exerting less injury to household goods, of its lesser toxicity to the higher forms of animal life, and because of the lesser danger of fire; that it is the best disinfectant at present known for the disinfection of infected dwellings, and that, while inferior in penetrative power to steam and dry heat at 230° F., it is better adapted for the disinfection of fine wearing apparel, furs, leather, upholstery, books, and the like, than any other disinfectant.

DR. ALFRED MÖELLER (*Kobert, Görbersdorfer Veröffentlichungen I.*), experimenting with pastilles of trioxymethylene and Schering's lamp, using 1.5 to 2 grammes to the cubic metre of air-space, reports favorable results in the disinfection of exposed objects infected with tuberculous sputum, ordinary

room dust, dust from old unused books, diphtheria bacilli, diplococci, streptococcus pyogenes, staphylococcus pyogenes aureus, staphylococcus albus and citreus, bacterium coli communis, and ordinary water bacteria. Guinea-pigs exposed to the action of the gas were not harmfully affected.

A. New Method of Preserving Meat.—According to MR. OLIVER J. D. HUGHES, United States Consul at Sonneberg (*Advance Sheets of Consular Reports*, No. 144), a new method of preserving freshly-killed meats has been discovered by the Danish zoölogist August Fjilstrup, which has stood a remarkably hard three-months' test at the Odeuse (Danish) Company's slaughter-houses in a very satisfactory manner. The method is very simple, and might be of great service for troops in the tropics. The animal is first killed or stunned by being shot in the forehead in such a way as not to injure the brain proper. As the animal drops senseless an assistant cuts down over the heart, opens a ventricle and allows all the blood to flow out, on the theory that the decomposition of the blood is almost entirely responsible for the quick putrefaction of fresh meats. Immediately thereafter a salt solution of varying strength, according to the length of time the meat is to be kept, is injected by means of a powerful syringe through the bloodvessels. The process takes but a few minutes, and the meat is ready for use and can be cut up at once. It has been examined and very favorably reported on by the general councils at Odeuse and Aarhus, and also by many experts.

The Microbe of Rabies.—The phenomena of rabies, its communicability, incubation, and the success attending prophylactic inoculations, are such as to leave no reasonable doubt as to its dependence on a specific and pathogenic microbe, even should this forever elude detection. Pasteur himself and his assistants were too much engrossed in improving their methods of prevention to turn their attention to the more purely scientific aspect of its etiology; but other bacteriologists, as Foll, Ferran, Rivolta, and Spinelli, noticed in their preparations of secretions and tissues a bacillus or bacilli which they believed to be specific.

Sanfelice, by a special staining process, detected in sections of the spinal cord of a boy who had died of hydrophobia enormous numbers of the microbe described by Spinelli and Rivolta, and his observations were fully confirmed by Memmo of Rome. But within the last year Memmo seems to have established its claims as the specific cause of this disease beyond the possibility of doubt. He has succeeded in cultivating it in artificial media, and, by inoculations with cultures of the fourth or later generations, in inducing the disease in dogs, rodents, and birds, with the typical differences characteristic of each. Thus, in rabbits and guinea-pigs the incubation period did not exceed ten to twenty days, and the disease was of the paralytic form familiar to all in Pasteur institutes; in dogs, on the other hand, the attack was delayed until between thirty and sixty days after inoculation and had all the characters of genuine rabies. He found the bacillus in the cerebro-spinal fluid, in the substance of the brain and cord, in the saliva and parotid gland, and in the aqueous humor of four dogs dying of the natural disease, and of dogs, rabbits, guinea-pigs, and pigeons in which it had been produced by inoculation. Its cultivation, however, was difficult, fluid media (especially one of broth with

glucose, acidulated with tartaric acid) being better than solid ones, though repeated plate cultures were required for its isolation. The growth did not appear under a week, and was easily inhibited or arrested by the admission of extraneous germs from the air or the dust of the laboratory. Whether his discovery will have any influence on the practice and cruder methods of Pasteurism is a question as to which Memmo is silent.—*Centbl. f. Bakt.*, Abt. i., Bd. xx., 17, 18.

Sources of Public Water Supplies.—The “water famines,” as they are called, or the recurring scarcity in the districts supplied by the East London Water Company, though a matter in itself of local concern only, serve to bring into prominence several questions of universal interest.

1. The unsuitability of comparatively small rivers and of superficial gravels as sources of water for large communities, since they are dependent on the rainfall of the locality, and affected by seasons of drought; while the extensive pumping operations of the company’s works are apt to dry up the private wells in the neighborhood, and, by lowering the level of the ground-water, to starve the agriculture of the district.

2. The advantages of sinking wells for public supplies, wherever the local geological conditions permit, through impermeable strata into underlying water-bearing beds (in the case of London this is chalk), between which and the superficial tertiary sands and gravels a thick stratum of stiff blue clay is interposed. Such deep borings have no influence on the surface-wells around which dip into the ground water only, and the stores at these depths, being the accumulation through long ages of the rainfall over wide extents of hills and uplands, where the formation comes to the surface, gravitating toward a vast subterranean trough or basin, are practically inexhaustible, and not subject to seasonal or periodical fluctuations.

3. The value of Deacon’s water-waste meters lies in detecting and enabling the authorities to prevent the waste that results from the giving way of the joints of the street-mains under the vibration caused by heavy traffic or the sinking consequent on excavations in the roadways. These meters are self-registering manometers which mark by tracings on a revolving drum every fluctuation in the pressure of the water within the main so delicately that under the “constant” service the opening of a single tap at hours when the general consumption is suspended is promptly indicated. These readings are daily sent in to the office for examination, where, under the intermittent service, they serve to check the reports of the turncocks as to their proceedings on their rounds; and under either system a continued depression of the pressure in any main not otherwise accounted for raises a suspicion of leakage. And in the silent hours of the following night an inspector is sent out to localize the leak by auscultation with a special form of stethoscope of every hydrant and of the ground above every joint, connection, and branch-pipe in the course of the main.

This has been the practice of the East London Company for twenty years, and they have at the present time two hundred and fifty instruments at work. The amount of waste thus obviated may be judged of by the experience of the Lambeth Company, who found that, by availing themselves of the information afforded by these means, they were able to reduce the gross or nom-

inal supply per head from thirty-four to twenty gallons without any stinting of the quantity actually dealt out to the consumers; in other words, they effected a saving of 30 per cent. that had previously run to waste in the sub-soil unobserved.

4. The last lesson of the water famine is that a constant service does not dispense with the necessity for some private storage in cisterns. Theoretically it should, but interruptions or suspensions of the supply can never be wholly avoided. Cisterns, it is true, as commonly constructed and located are open to grave objections, if not constituting actual dangers to health. But this is solely due to the stupidity and perversity of builders.

A cylindrical cistern of galvanized iron with an inverted cone for its base, from the "apex" or lowest point of which the service-pipe depends, the supply- and overflow-pipes alike being soldered or screwed into the vertical sides of the cylinder, and the cover fitting tight with rim and flange, like the lid of a saucepan or kettle, would effectually preclude the entrance of vermin or dust and the deposit of the dirt, being self-cleansing, or, more correctly, never requiring cleansing. It would be equally applicable to intermittent and constant service, and, if capable of holding a couple of days' supply, would render casual interruptions unfelt. Of course, under the constant service a draw-off tap could be connected with the *rising main*, in order that the water required for drinking, as such, might be fresh and *cold* from the public main. Such an improved form of cistern, it need scarcely be added, should be fixed in a position well protected from frost.

CORRIGENDUM.—In THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES for November, 1898, p. 516, the reference to Dr. Mears, by whom the first suggestion for removal of the Gasserian ganglion was made, was incorrectly printed "Trans. of the American Medical Association, vol. ii. p. 469." It should have been "Transactions of the American Surgical Association, vol. ii. p. 469."

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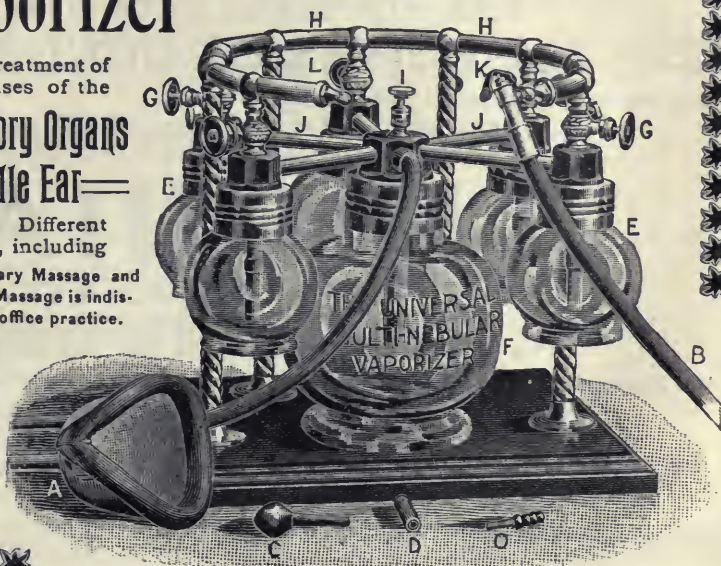
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